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CYSTOSCOPY

AS

ADJUVANT IN SURGERY

With an Atlas of Cystoscopic Views and
Concomitant Text for Physicians
and Students

BY

STAFF-SURGEON DR. O. RUMPEL

Lecturer in Surgery at the University of Berlin

Only authorized English Translation

BY

P. W. SHEDD, M.D.

New York

WITH 85 ILLUSTRATIONS IN COLOR ON 36 PLATES
AND 22 TEXTUAL FIGURES



LONDON
REBMAN LIMITED

129 Shaftesbury Avenue, W.C.

NEW YORK
REBMAN COMPANY

1123 Broadway

1915

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Printed in America

Preface.

Of all the branches of medical science materially advanced by *Nitze's* ingenious invention, the cystoscopic mirror, surgery is easily first. The diagnosis and the therapy of surgical conditions of the uropoietic tract have profited equally by its discovery, and it seems, therefore, of practical value to gather together the pathologic data concerning the urinary bladder as revealed by the cystoscope, and view them from the surgeon's standpoint. In the course of years I have collected, both in the Royal Surgical Clinic of the University and in private practice, all obtainable data of interest, and have had them drawn by *Max Queisser's* skilful hand. The result of such endeavor is the present volume, for whose beauty of execution I am deeply indebted to the publishers.

As nearly all the cases here illustrated underwent operation, a confirmation and perfecting of diagnosis was rendered possible by the histologic examination of tissues.

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Congenital Anomalies.

Of those congenital anomalies of the urinary bladder whose cognizance is essentially due to cystoscopic methods, the diverticulum may develop practical surgical significance, whether caused by a stagnation of urine (with its accompanying phenomena of inflammation), or resulting from the presence *in situ* of foreign bodies, tumors, concretions. Not infrequently it is found where its existence had not been suspected diagnostically.

The appearance of a congenital diverticulum is extremely characteristic (Plate II., Fig. 6). Surrounded by normal mucous membrane, either smooth or in slightly radial folds, there is noted a more or less circular, sharply contoured defect, black or dark red in hue, and much resembling the wound made by punch-forceps. If the margin be examined more closely, we get the impression of a protrusion or extroversion of the mucous membrane. Along the sharp edge of the fold, the blood vessels curving over it may be seen distinctly and traced until lost in the shadow of the unilluminated area of the diverticulum. If the latter be not too extensive and its apparent aperture not too far from the urethral entrance into the bladder, its walls may be inspected by proper manipulation of the cystoscope, particularly when we are dealing with a neoplastic or concretionary growth in the diverticular area.

Cystoscopically, the congenital diverticulum is differentiated from the acquired diverticulum of the trabecular bladder by its large and circular (or approximately circular) area, the acquired form presenting commonly a smaller opening, often irregular or angular because of the trabecular folds. Furthermore, a multiplicity of protrusions or eversions points rather to a genesis resulting from stagnation of urine, although, rarely, multiple congenital diverticula are on record. Fig. 7, Plate III. shows a diverticulum with sharply defined margin in the vertex of the bladder of a prostatic patient. Its rounded anterior edge recalls the congenital form, whilst, posteriorly, an obliquely running, straight trabeculoid fold delimits the diverticular area. In the periphery of the visual field is seen at the highest point of the vesical cavity an air-bubble reflecting the arc-light of the lamp. Fig. 8 shows some particularly well-developed spiral trabeculae on the side-walls of the same bladder.

Congenital anomalies of the uretral openings are of special interest, surgically. Their absence on one side or their structural imperfection, their duplication or abnormality of location lead, in certain conditions, to significant deductions in the matter of congenital defect or rudimentary development, of renal and uretral variation or change of position and form. However, variations of position along the urinary tract are so manifold that cystoscopic demonstration alone of departures from the norm in uretral location, gives no valid conclusion as to the species of abnormality present. One must postulate also that, even where the uretral entrances into the bladder are seemingly normal, deviations from the natural course or structure may exist higher up. If, therefore, clinical symptoms lead to suspicion of such anomalies, *e. g.*, of an anoma-

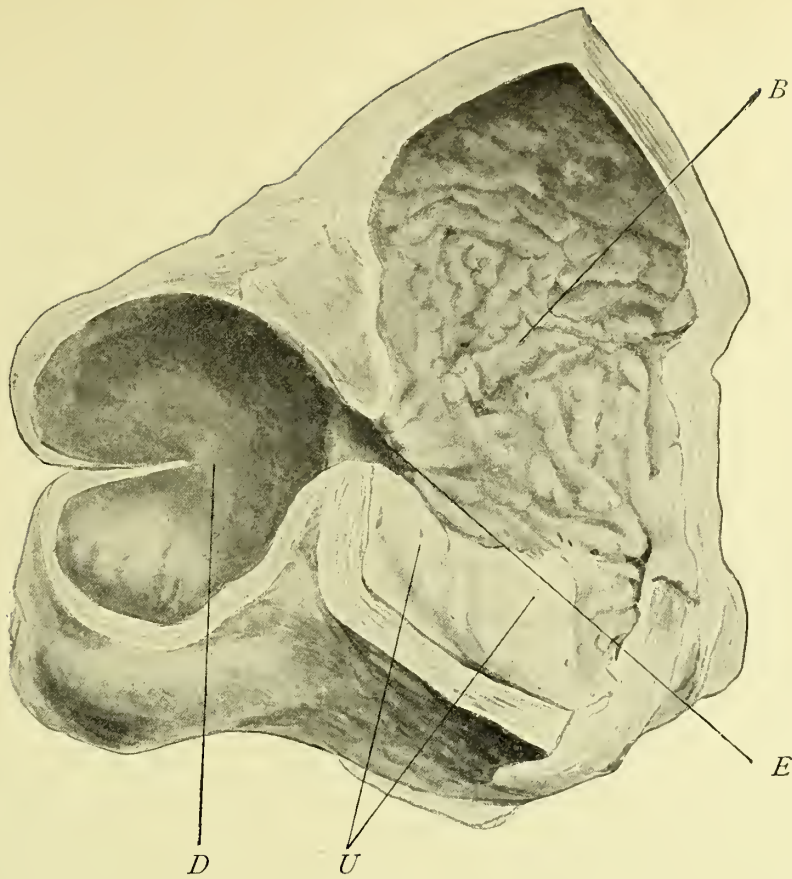


Fig. 1

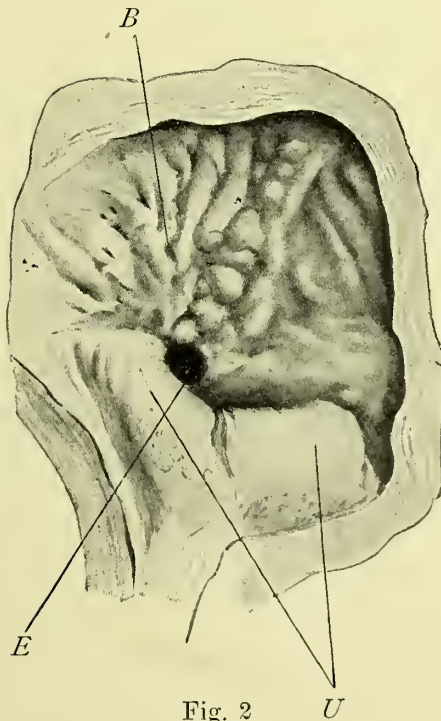


Fig. 2

Large diverticulum in the fundus of the bladder.
E. Entrance into the diverticulum; *D.* Diverticulum;
U. Uretral orifices; *B.* The vesical cavity.

lous position of the kidney, an extremely valuable aid in diagnosis is the combination, with cystoscopy, of the Röntgen examination of the uretral routes (a subject to be considered more in particulate farther on).

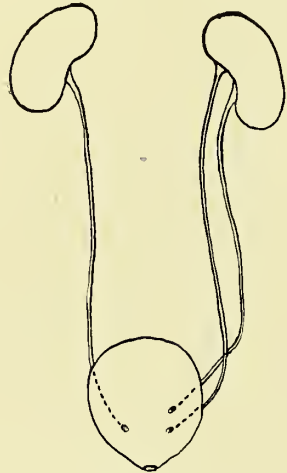


Fig. 3

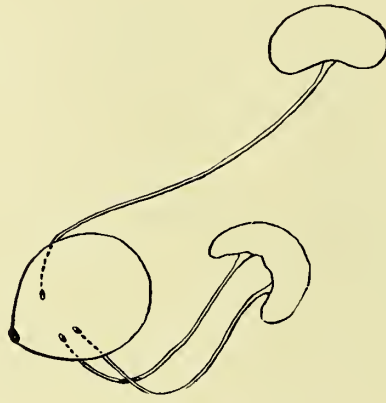


Fig. 4

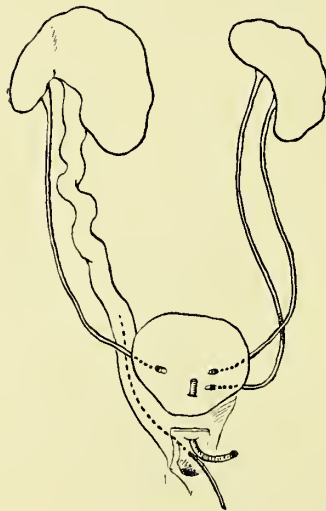


Fig. 5

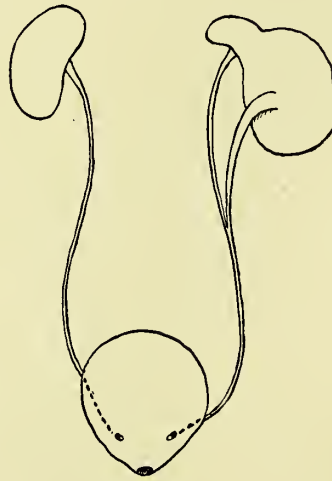


Fig. 6

Of the cases* of congenital anomaly in the form and position of kidneys and ureters, observed *in vivo* by myself, deviations from the uretral norm were re-

*These cases have, in part, been reported elsewhere; we shall present here only the correlated cystoscopic findings.

peatedly demonstrable with the cystoscope. Thus, there were several instances of duplication of the left uretral orifice, and in two cases the two entirely distinct ureters led to a double kidney, normal in function; in another case they drained the pelvis of a hydronephrotic kidney. The variation from norm in another instance consisted of the left uretral meatus entering the region of the internal orifice of the urethra, with a consecutive development of hydronephrosis; in another case the uretral orifice was absent, the right kidney and ureter being of but rudimentary development. In a case recently operated by the writer, there was a high degree of abnormality in structure and position of the uriniferous parts, for, whilst one of the two right ureters emptied into the bladder according to norm, the superfluous second one ended anteriorly in the vulva near the *orificium externum* of the urethra. The right kidney was composed of two equal portions, one of which exhibited hydronephrotic degeneration and, oddly enough, belonged to the ureter of abnormal course and orifice. (Cf. Fig. 7 in the text.) On the left side there were also two uretral orifices, both, however, emptying into the bladder. Autopsy showed also the existence of a double left kidney. In three other cases where cystoscopic examination demonstrated no deviation from normal, there was a horseshoe kidney present in one; in another, a high bifurcation of the ureter with double kidney, one-half of which showed hydronephrotic degeneration; finally, in the third case a rudimentary kidney with cystic degeneration.

The relatively frequent existence of such abnormalities shows the practical value of exact diagnosis in these often difficult cases. The method first recommended, I believe, by *Tuffier*, of passing uretral sounds followed by a Röntgen examination has often proved

its worth in verifying the course of the ureters and their relation to the kidneys.

In the execution of this combined method of examination, there is, in my opinion, no need for any special instruments. The ordinary uretral catheter, with its delicate mandrin of nickel, is passed into the ureter and pushed carefully upward as far as possible. A photographic plate is then placed beneath the back of the patient quietly lying upon the table for examination, and a Röntgen skiagraph of the area is taken.

The results shown by this method in the two above-mentioned cases of uretral duplication are seen in Figs. 8-9 of the text.

In one case the patient was a countryman, *æ.t.* 27, with a diagnosis of intermittent left-sided hydronephrosis. Operation developed the absence of the left kidney from its normal location. Then the above-described diagnostic method was employed, showing indisputably that the delicate shadow of the mandrin on the right side reached to the normal junction of ureter and renal pelvis, whilst on the left side, after forming an S-shaped loop, it terminated at the entrance into the true pelvis.

The second operation, done because of these findings, verified the dislocation of the left kidney, which, hydronephrotic, lay at the entrance of the true pelvis.

Later, *i. e.*, after the first unsuccessful operation, there was demonstrated a superfluous uretral orifice on the left side, overlooked in the earlier examination. Closer observation showed, namely, that the left uretral orifice lay more anteriorly, nearer the vesical cervix, than that on the right side, thus causing a slight asymmetry of the trigone, and also demonstrating that behind the left uretral orifice, a second, small, punctate uretral opening was present.

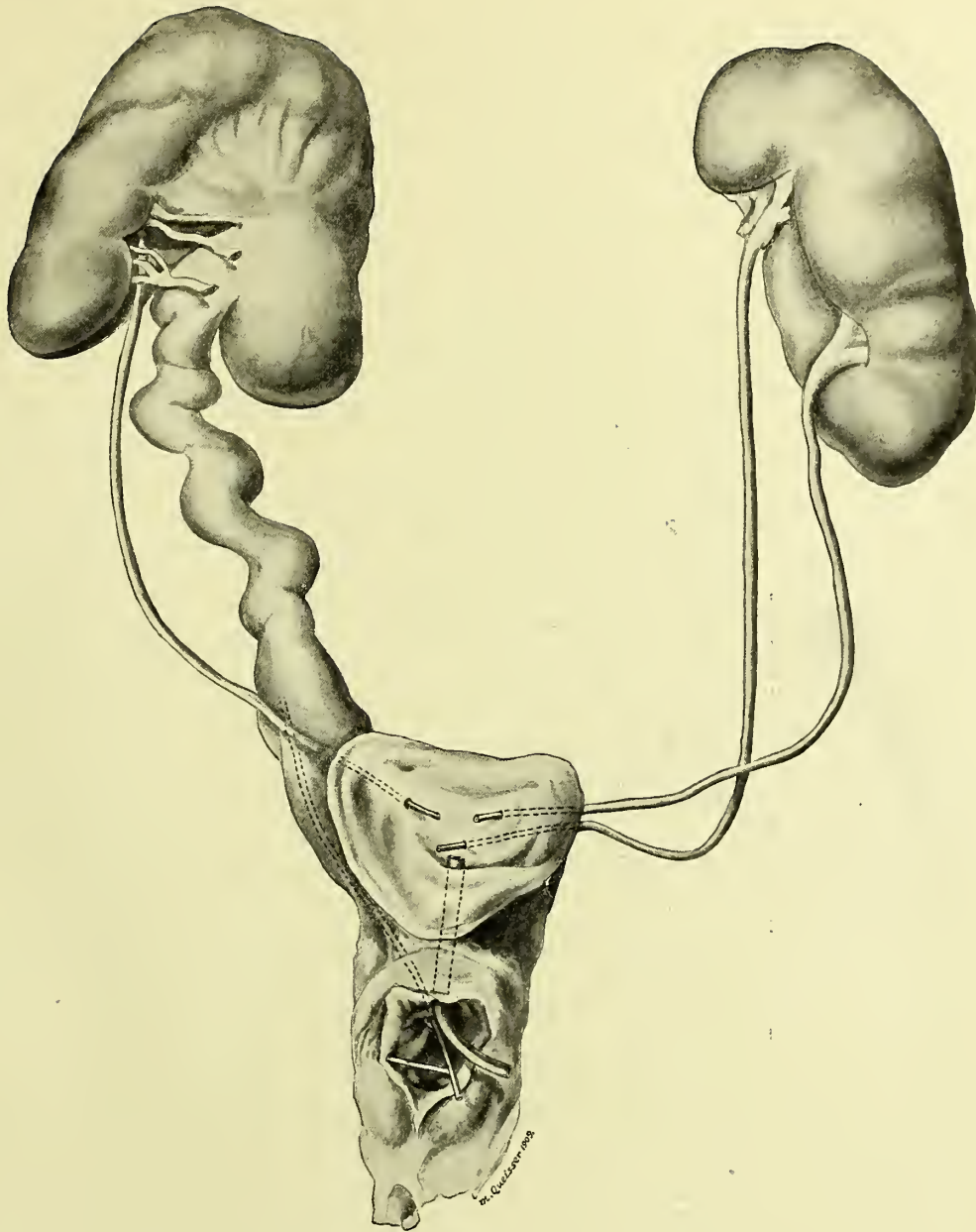


Fig. 7

Duplication of both kidneys and both ureters; one-half, or the right kidney, showing hydronephrotic degeneration, with the accompanying dilated ureter emptying into the vulval area

Had this anomaly of left-sided uretral duplication been known earlier, it is probable that the abnormal renal location would have been diagnosed before. It should be made a rule in each and every cystoscopically visible uretral anomaly that, the course of the ureter be verified by Röntgen examination, just as the exhibition of so dependable a method is imperatively

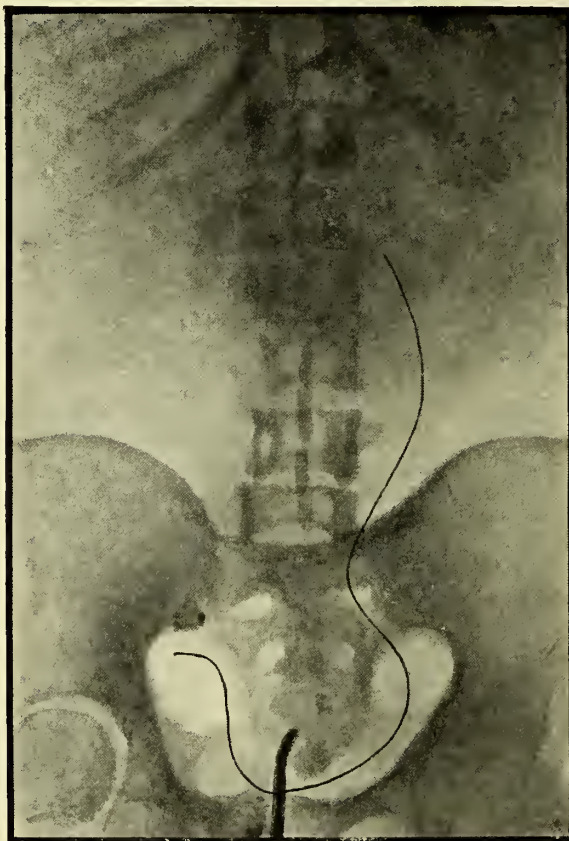


Fig. 8
Hydronephrotic left renal pelvis. Skiagraph
with uretral sounds in position.

required when there is any suspicion of renal displacement.

Quite as indisputably as the method in this case indicated the uretral course where there was present a

kidney at the pelvic inlet, so in the second case it showed a complete division of the uriniferous channel and a left double kidney located at the normal site, the discovery in this instance being quite accidental. There existed three well-formed and normally functioning uretral orifices, of which two were located in the left half of the fundus, one behind the other. The cystoscopic picture is found on Plate II., Figs. 4-5. The distance of the left anterior uretral orifice from the orificium internum was less than on the right side, and the second uretral opening, which corresponded in position with the one on the right, lay about 2 cm. behind the anterior left ureter. The skiagraph showed (text, Fig. 9) the course of the two left ureters through which sounds had been simultaneously passed. In gentle curvature the uretral shadows traverse in parallel the true pelvis; then, crossing one another so that the superior ureter lies laterally, an ascent is made along the pelvic curve of the sacrum up into the normal renal region where the two shadow-lines end, though not at the same level. From the posterior or superior orifice, the ureter, taking a lateral course, passes within a finger's-breadth distance from the transverse process of the first lumbar vertebra; the lower ureter attains the level of the cartilaginous disk between the second and third lumbar vertebræ.

The cases of double kidney on record commonly describe the two pelves as superimposed, one upon the other, a condition apparently present in the case just described. That we were dealing with a complete separation of renal pelves and calyx systems, was made evident by the rhythmic but non-synchronous flow of urine from the two uropoietic systems.

Furthermore, it was interesting to note that the urines passed by these two left ureters were alike in

composition; even the cryoscopic test showed complete identity in the degrees of concentration; hence, the separated halves of kidney substance must have been equivalent in function, and, that the conditions for drainage from the displaced renal pelvis were good, appears deducible from the course of the uretral shadows in the Röntgen picture.

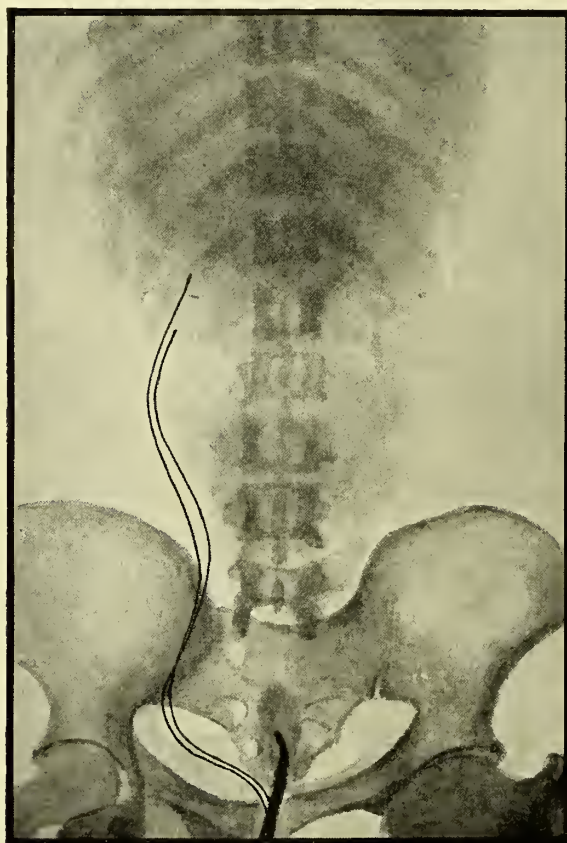


Fig. 9

Left uretral duplication. Röntgen portrayal of the left ureters with sounds passed. (Cystoscopic views: Plate II., Figs. 4-5.)

In a case operated by *Kümmell* which I had opportunity to observe, there was present, with a similar double kidney, a stasis of urine in the deeper-lying

renal pelvis, because of which this half of the kidney had undergone hydronephrotic degeneration. The ureters of this half first arched upwards, then descended and emptied into the ureter of the other half of the double kidney. Because of the oblique descent of both ureters in the present instance, it is probable that there were no hindrances to a free defluxion of urine. Examination of the patient (author's case) developed no other pathologic findings.

Recently I had opportunity to observe a remarkable displacement of a left-sided uretral meatus. The ostium or vesical orifice, difficultly found in the cystoscopic examination, lay close to the orificium internum of the urethra, while the opening of the right ureter, at the apex of a well-developed tuberosity, occupied its normal position. Because of the marked asymmetry of the trigone, I had inferred an absence of the left uretral opening, but prolonged search found its narrow but distinct rift lying within the reddened sphincter zone close to the urethral fold of tissue.

In this patient, *et. 26*, no other reason for the presence of a left-sided hydronephrosis was demonstrable; the cystically degenerated kidney was normally located, the ureter was inserted correctly in the renal pelvis, was patent and without torsion. Hence, the only factor responsible for the stasis of urine in the left kidney was, doubtless, a compression of the uretral lumen by the muscle fibers of the sphincter.

In general, one should be extremely diffident in promulgating the diagnosis of a unilateral renal defect based solely upon the invisibility of a uretral orifice. This may be so minute as to be completely hidden behind some small fold of mucous membrane, or, as previously mentioned, its misplacement, whether congenital or due to some passive change in form of the

vesical fundus, may render its discovery impossible. In dubious cases it is advisable to determine function by means of subcutaneous injection of colors in solution. The supposition of absence of a uretral orifice may also be given a degree of credence when, other things being normal, the trigonal contour exhibits distinct unilateral alteration. *Zuckerkanndl** describes such a condition, found post mortem, where one of the uretral tubercles, well-shaped and normal, completed a half of the trigone, whilst on the other side no tubercle was in evidence, the asymmetry of the trigonal field, therefore, being most striking.

In two cases of congenital hypoplasia of one kidney, the cystoscopic results were as follows: In one case two uretral ostia were normally placed, but from the right ureter no flow of urine was observable and a sound penetrated only a few millimeters. Operation showed the rudiment of a kidney, scarcely the size of a pigeon egg and with cystic degeneration. In the other case there was found, cystoscopically, a well-developed and active uretral orifice on the left side, whilst on the right, despite the carefulest examination, no opening was discernible. Operation showed a rudimentary and cystically degenerated kidney, with a thin and apparently obliterated ureter, pendent from the pelvis, but the farther course of the tube could not be determined *intra operationem*.

*Handbuch für Urologie. Wien, 1904.

Cystitis.

Inflammatory conditions in the bladder commonly require cystoscopic investigation only when chronicity has been attained. In some exceptional conditions, *e. g.*, acute inflammations due to infection because of the presence of a foreign body, the aid of the cystoscope is demanded.

Henceforth, the surgeon will oftener be in a position to observe endoscopically the picture of an acutely inflamed vesical mucosa.

The characteristic alteration noted in the inflamed mucous membrane consists—disregarding a greater or less degree of redness—of an indistinctness, a vagueness of appearance in sharp contrast to the clarity of the normal, transparent mucosa with its delicate vascular branchings and its smooth, brilliant superficies. Injected blood-vessels, hemic extravasation, edema, ulceration, excess of secretions cause, according to their intensity, the greatest variations in the pictures noted upon the cystoscopic mirror.

Generally, it may be said that, in inverse ratio to the gravity and extent of the inflammatory process, there will occur a diminution in the endoscopic field of vision; hence, the possibility of employing cystoscopic findings as an aid in practical diagnosis also diminishes. In an acute serious cystitis—for example, one developed by foreign bodies which have lain greater or less time in the bladder—the cystoscope shows little more

than a dark red, homogenous surface where none of the finer differentiating characteristics are discernible. The markedly tumefied and reddened superficies has the appearance of that of a recent wound bleeding spontaneously or from the least motion. Irregular wheals of tissue alternate with deep, transversely cleft furrows. Desquamated, necrotic epithelial shreds, clumps of pus, masses of coagulated fibrin float about in the liquid like pieces from a tumor and obscure the field. The mucosal tumefaction, extending to all parts of the bladder wall, clouds over the entire vesical surface (otherwise so characteristic) and renders impossible any determination of the most important anatomic points.

Without general anesthesia or anesthesia by lumbar puncture, an examination is hardly feasible because of the great pain and the bladder's very mediocre powers of distension.

Unless indicated by unusual conditions, a cystoscopy, particularly in a grave acute cystitis, should be avoided, for, disregarding the difficulties of technic involved, the results of cystoscopic investigation in such cases are often so meager and imperfect that they are entirely disproportionate to the gravity of the attempt.

It is quite otherwise where the degree of inflammation is slight and in the chronic forms of vesical catarrh; here we have the real province of cystoscopy and here we must first determine the character of the inflammatory process. With the aid of the irrigating cystoscope, which permits the most thorough cleansing of the bladder during the examination, we are able to ascertain whether the mucosal blood-vessels are merely more turgid, whether a hemorrhage has occurred, whether the entire mucous membrane is edematous or only so in well-defined areas or foci, whether ulcera-

tions are present, or, whether deposits of pus and coagulated fibrin cover the vesical parietes.

Practically, it is more important to differentiate betwixt the diffuse and the circumscribed form of inflammation, for, in certain conditions localization informs us as to the avenue of infection.

If the more or less violent diffuse cystitis (the invariable sequela of an infection) begins to abate, it becomes necessary to determine if there exist demonstrable pathologic alterations at the points of entry, *i. e.*, the orifices of urethra and ureters. Naturally, such alterations do not always take place. Hence, even in the case of an infection descendent from the kidney, we are able to determine only by cystoscopic methods whether a general plethora of blood-vessels be present, or, whether the inflammatory process be of more ancient date, with island-like foci of reddened, swollen mucous membrane irregularly scattered over the entire bladder, or, as is more common, few obvious alterations are discoverable in a mucosa which, perhaps, in its entirety, appears cloudy. Even the uretral orifices—though through them the infection passed—may seem perfectly intact and surrounded by an areola of normal mucous membrane.

It is not improbable that a cystitis might be cystoscopically diagnosed as of uretral infection when the edema and extravasation of blood is limited to the region of the neck of the bladder whilst the uretral orifices are found to be healthy. Such conditions are often present, as is well known, in catarrhs due to the use of a catheter or to gonococcal infection. If the entire trigonal area and the fundus are implicated in the tumefaction, one should seek other sources of infection. Very frequently in just such a chronic cystitis, developing from a renal tuberculo-

sis, the cervix vesicæ is the part of the bladder chiefly affected.

Of much greater, often decisive significance is the condition of the uretral ostia. Every inflammatory process in the renal substance, due to bacterial genesis, is able to effect pathologic changes at the correspondent uretral orifice, incontrovertibly demonstrable as such by the use of the cystoscope, whether the infection advanced by contiguity from renal pelvis along the uretral mucosa, or whether a bacteriuria excited a circumscribed inflammation of the vesical mucosa at the uretral exitus. The minimal degrees of such pathologic change, confined to the correspondent ostium and its immediate vicinity, consist 1) in a swelling of the not infrequently somewhat prolapsed uretral mucous membrane, and 2) in the presence of a circumscribed areolar rubescence of the circumjacent vesical mucosa. (Cf. Figs. 13, 14, Plate VI.; Figs. 15, 16, Plate VII.; and Figs. 38, 39, Plate XVII.) Both symptoms may—however perfect and striking in many cases—be so difficultly perceptible as to be recognized only after the carefulest and most accurate search. That occasionally, in such cases, a diagnostic error may be made, is well known and quite comprehensible. The least variation in the angle of vision or in the distance at which the object is observed, will cause very noticeable change in the appearance of the ostium and the surrounding mucous membrane. This is particularly true of the increase in redness and caliber of blood-channels. The character of the circumscribed inflammatory redness may be first surely cognized when, to the greater injection or vascular plethora is added a dimness or cloudiness of the mucosa, invariably terminating in edema. The pathologic picture becomes still more clear if small ulcers are present in the mu-

cous membrane. These may cause the uretral opening to undergo remarkable changes. Instead of the round, oval or slit-like aperture, bounded by lip-like folds or elevations of mucous membrane, we see a rigid, ragged, irregular opening, possibly covered over in part by masses of coagulated fibrin from the ulcerations. Cicatricial contractions, also, may markedly influence the contour of the lumen, and if edema and ulceration of the surrounding mucous membrane become still more prominent, it is often impossible to locate the uretral orifice.

With this study of alterations in form of the uretral orifices, should be conjoined an observation of uretral function. This may be null, if the lumen of the tube be obliterated higher up; it may be retarded, as shown by the sluggish, infrequent contractions. If the ostium be large and crater-shaped, we shall not see the closure of the lip-like folds of mucous membrane normally observed during the intervals of uretral micturition but rather a rigid, open lumen, even when no urine is passing. The stream of urine may also appear distinctly altered in form when more or less large masses of pus are being expelled. From the thick, yellow, purulent mass, often sausage-like in form from its passage through the uretral tube, to the tiniest flecks in the urine, all degrees of admixture of pus are often clearly perceived.

All the cystoscopically demonstrable changes in the uretral openings point with the greatest probability to a descendent infectious inflammatory process. The kind of infection, however, is not determinable by inspection alone of syndromes like those just described. Such conditions, and in all grades of severity, I have seen in pyelonephritis, in lithiasis with infection, and in tuberculosis. If, in the last condition, we desire to be

justified in speaking of "specific" uretral changes, then we shall need to furnish the evidence of specificity, *i. e.*, the tubercle. It is true that we very often find in renal tuberculosis, particularly in the early forms, changes in the correspondent uretral ostium like those just described as mild in degree, *viz.*, gaping of the orifice and a circumscribed areolar redness of the vesical mucous membrane, but, similar pictures are also seen in the non-specific pyonephrosis, and in renal calculus with infection by other bacterial species. A uretral ostium, with its circumjacent vesical mucosa specifically affected in a case of renal tuberculosis, is portrayed in Fig. 18, Plate VIII.

The exitus of the left ureter is strikingly enlarged and of irregular contour. Whilst the right uretral orifice presents an oval dimple or pit bounded by smooth, labioid elevations of the vesical mucous membrane, we find the left ostium a wide and deep (hence black) hole whose margin shows small indentations here and there; in the lip-like folds of uretral mucosa are irregular elevations in the form of small, whitish-yellow points, the size of a pinhead. The surrounding vesical mucous membrane within an area about the size of a half-dollar, is very red and presents a tufted appearance. In this region, plainly edematous, the vascular channels have vanished, whilst close by (in the upper right portion of Fig. 18), we again find the distinct and delicate vascular branching and the smooth, yellowish-red aspect of normal vesical mucosa. Surrounding the uretral aperture, and within the edematous and reddened area, are numerous round or oval, yellowish-gray elevations, varying from the size of a pinhead to that of a small lentil, some of them apparently nodular, others ulcerative in aspect.

Not less characteristic are the changes in the uretral

orifice and adjacent mucous membrane in a case of renal tuberculosis, shown in Figs. 21, 22, Plate IX.

Here the right ostium exhibits the gaping and the areolar redness just mentioned, which, however, are not, of themselves, absolutely diagnostic of a tuberculous affection. Even the tufted appearance and vivid redness of the circumjacent vesical mucosa would not warrant a diagnosis of tuberculous infection unless the typical yellowish-gray nodules and the flat ulcerative areas formed by their breaking down, were present in the adjacent visual field.

In this case we are dealing with a circumscribed, though more extensive, cystitis tuberculosa. The whole left side of the trigonal area, however, is free of infection and covered with a normal, smooth, vesical mucosa, nor is there any pathologic change whatsoever about the left uretral aperture.

Figs. 36, 37, Plate XVI., show a circumscribed cystitis ulcerosa localized in the region of the left ostium. The ulcerative process, apparently formed by the confluence of a number of foci, extended over an area larger than a quarter-dollar and covered with discolored tissue shreds and coagula of fibrin which, on careful scrutiny, are seen floating about. An actual uretral orifice is not visible. The contiguous mucous membrane is vivid red and swollen, but the few visible blood-vessels have been washed out in the drawing. The tuberculous nature of the ulceration is shown by the typical nodules scattered here and there in the periphery of the visual field.

If, as in these cases, we are dealing with a sharply circumscribed inflammatory process clearly localized about a uretral opening, it is extremely probable that the diagnosis of specific descendent inflammation, due to tuberculosis of the corresponding kidney, will be

correct. It is quite otherwise, however, if we have before us a much greater area of inflammatory tumefaction and ulceration, extending beyond the affected half of the trigone, even to or near the other uretral aperture, which, finally, may be completely surrounded by the edematous and ulcerating tissues.

In such a case I do not consider it advisable even to announce approximately a diagnosis of the source of infection, based, perhaps, upon the degree of intensity of the inflammatory process in areas circumjacent to both ostia.

Observation, also, of the uretral flow often fails to give the needful certainty of decision as to whether the inflammation of the bladder be, chiefly, renal in origin, and, if so, attributable to which kidney. Judgment as to whether the urine passing be clear or turbid, is extremely difficult where ulcerative processes are present in the vesical mucosa. It is true that small flecks often may be seen distinctly tossing about in the expelled fluid; and in renal tuberculosis this is no rare phenomenon, though not the rule. It is indicative of advanced disintegrant processes in the renal substance, but, absence of the flecks or shreds is no warrant of intact kidneys.

From the practical surgical viewpoint, we thus see that the diagnosis established by cystoscopic observation alone, is limited. In all dubious cases, it must be confirmed by examination of the urine from each kidney, that we may gain certain knowledge whether the infectious urine causing vesical inflammation comes from one or both secreting organs. Investigation, also, of functional power is adjuvant. The execution, however, of both methods affords more certainty if uretral catheters are used. The reliability of data obtained by catheterism is superior to that

got by any other method of investigation. This and other diagnostic procedures will be considered more fully later.

Figs. 25, 33, Plates XI., XIV. present cystoscopic findings in cases of more or less extensive cystitis tuberculosa affecting the vesical fundus, the region about the two uretral orifices and the cervix. Whilst in Fig. 25 the ostium exhibits symptoms only of an inflammation of the higher urinary tract, we find in Fig. 28 a characteristic tuberculous modification. Figs. 29, 31 show discrete groups of tubercles and typical ulcerations, Fig. 26 likewise. Fig. 32 represents a strikingly altered uretral ostium. The true aperture is not visible, lying, as it does, at the bottom of a large, crater-like depression surrounded by irregular elevations or folds of mucous membrane. In the immediate vicinity, amid the reddened, edematous mucosæ, a group of small, circular ulcers is more or less distinctly outlined. No blood-vessels are visible. In Fig. 33, in the immediate neighborhood of the uretral opening, is seen a peculiar modification of the mucous membrane in the form of a conglomeration of smaller and larger, hemispherical, phlyctenoid excrescences. At the summit of each translucent hemisphere we note a distinct reflection of light rays; the surrounding mucous membrane is reddened, tufted. We have here a picture of "bullous edema" which, in severe inflammatory processes in the vesical parietes, is found now and then; sometimes affecting smaller, sometimes greater areas of the vesical mucosa. As is well known, *Kolischer* first described changes of this sort in the female bladder as phenomena of stasis due to adjacent inflammatory processes.

In the case just described, there was advanced tuberculosis of epididymes and kidneys.

Quite isolated tuberculous lesions are not infrequently found in the fundus of the bladder. If the uretral regions are not affected we might be justified in attributing to them hematogenic origin. I have found them more numerous, for example, where there was an epididymitis tuberculosa. In Figs. 34 and 35, Plate XV., such forms are seen. In the figure to the left, in the uniformly reddened mucous membrane, are three yellowish-gray, round elevations about the size of pinheads, lying close together, and surrounded by a narrow, distinctly hyperemic zone. The adjacent blood-vessel has lost its clear contour and appears washed out, whilst another, nearer the periphery of the field of vision, is more distinctly outlined and also more distended than the norm. The mucous membrane appears somewhat undulated because of obliquely running folds or elevations. The right-hand figure depicts a single, similar nodule located over a vascular twig. The mucosal and vascular characteristics are like those in the left-hand figure.

Peculiarly diagnostic of tubercle is the narrow, hyperemic zone or areola surrounding the nodule. Without the inflammatory phenomena distinctly present in mucous membrane and blood-vessels, diagnosis cannot be absolute, for, similar bud-like yellowish elevations, clearly reflective of a bright light, are found now and then in the normal bladder.

The fundus was the region affected; the remainder of the bladder was normal and both uretral ostia intact.

That primary vesical tuberculosis is rare, is a dictum confirmed by modern research and universally recognized. Cystoscopy has been materially helpful in shedding light upon the point at issue.

A much-discussed question concerns the cure of tuberculous cystitis after operative removal of the

primary focus, and in this matter also, the cystoscope has played an essential rôle, in that it has made anatomic changes accessible to vision. It is well known that the subjective phenomena of the catarrhal process almost invariably disappear soon after extirpation of the tuberculous kidney; the urine also may again become clear, but to conclude from this that the local inflammation of the bladder—if it were present—had been healed, would be an example of precipitate judgment.

Cystoscopic investigation makes it quite evident that considerable time must elapse before we can discuss the *restitutio ad integrum*, provided we were dealing with actual ulcerations of the vesical mucosa. I have examined a number of cases in this regard.

Fig. 19, Plate VIII., portrays the cystoscopic findings (almost six months after extirpation of the tuberculous left kidney) of the same uretral regions whose specific tuberculous lesions are depicted in Fig. 18. The most remarkable change is the disappearance of the intensive redness, the mucosa being of a hue approximating yellowish-white. The uretral ostium is shriveled but distinctly visible as a shallow dimple. The surrounding mucous membrane appears tufted and somewhat reddened, and in this region isolated, irregular, whitish flecks are scattered about, while from the periphery of the visual field, numerous blood-channels reach out toward the devasculated central area.

Clinically, there had been marked general improvement; the urine, however, remaining slightly turbid, and containing pus corpuscles. There had been no local treatment.

If, in this case, the initial cicatricial shriveling, which, within six months, occupied the site of the cir-

cumscripted, ulcerous inflammation, was cystoscopically demonstrable, another observation showed, however, that for a longer period perceptible local catarrhal lesions were present in the bladder, though the patient might have been classed as clinically "cured" at a much earlier date.

In the same case, the cystoscopic findings before the nephrectomy are depicted in Figs. 21 and 22, Plate IX. After operation the patient was repeatedly examined, but during the first three months, only slight regression of the ulcerative process in the bladder could be demonstrated, though the subjective symptoms had almost entirely disappeared. The conditions noted later—seven months after operation—are shown in Figs. 23, 24, Plate X. The mucous membrane of the greater portion of the bladder was of the normal, yellow-red hue, the blood-channels clearly defined. About the right uretral orifice there was some accentuation of the redness, and the vascular plexus appeared to be distended and washed out, as it were. The uretral meatus was a small, shallow dimple or pit, easily perceptible in the somewhat tufted, dimly outlined territory. Immediately adjacent to the uretral ostium, formerly the site of numerous ulcerations, the region is differentiated from normal mucosa only by the dimness of vascular contours and by a slight, tufty rubescence, whilst tubercles are nowhere to be seen.

Clinically, the health of the patient, who long ago returned to his official duties, is excellent. The urine is clear; he is able to retain it for three or four hours, and there is no difficulty or pain on micturition. Since the operation he has gained fifteen pounds in weight.

Results similar to those found in these two instances I have repeatedly demonstrated. In the patient with

the isolated vesical tubercles and an epididymitis tuberculosa, there were no nodules visible six months after the operation, though a circumscribed edema of the mucous membrane, with the characteristic washed-out appearance of the blood-vessels, was in evidence.

* A complete *restitutio ad integrum* in the anatomic sense, I have hitherto been unable to demonstrate in any case. The reason for this, however, may be that most of the observations were not continued over a sufficient period of time. Of greater import, it seems to me, is the proof furnished by the cystoscope that the specific tuberculous processes, the nodules and ulcerations, disappeared completely within a certain time without any local treatment of the bladder. This corresponds, in a measure, to the somewhat commonly current therapeutic views and procedures. If, however, after removal of the primary focus, there is no regression of the tuberculous phenomena present in the bladder, energetic local treatment is positively indicated, and the cystoscope will afford indications therefor. *Rovsing* has recently announced good results in such cases from irrigation with a carbolic acid solution.

Tumors.

In the cognition of a neoplasm in the urinary bladder, cystoscopy overtops all prior methods of investigation. If, hitherto, the chief endeavor was to corroborate diagnosis by gaining sight of at least a small portion of the new growth, we are now able to view the whole tumor *in situ*. However, even by this method we are able to see the superficies only of the growth, evidence, it is true, of the presence of the tumor, but affording only guarded conclusions as to its nature.

Of essential significance in cystoscopic diagnosis is the condition and behavior of the urinary bladder. If there is not much inflammation, the technic becomes very simple, but if compelled to investigate during continuous hemorrhage, irrigation must be carefully done until the return flow is perfectly clear. That which is unequivocally demonstrated in such cases by cystoscopy, consists in the following characteristics of the neoplasm observed: We note whether the growth has its origin in the mucous membrane or replaces its tissues; whether it lies beneath the mucosa and is covered by it; whether it is papillomatous in nature or a solid, spherical or tuberculated growth; whether it is broadly sessile or attached by a pedicle; whether its surface is intact or ulcerated; whether prominent or not in the vesical cavity; whether large or small, single or multiple; whether locally delimited or diffusely infiltrat-

ing; and, whether its site is at the fundus or in other parts of the vesical parietes. Often it is not easy to estimate its size, its pediculation or its more accurate localization, and judgment of its malignancy is, in most cases, of uncertain worth. Because of this, cystoscopic examination, in my opinion, cannot aid in separating neoplasms into two principal groups, *i. e.*, benign and malignant vesical tumors. That which, in the presence of a tumor of the bladder, lends characteristic appearance to a cystoscopic view of the mucous membrane, is the hypertrophy of the musculature. With no tumors of any size, do we find this characteristic absent. It gives the mucosa a denser appearance because of the projection of the muscle-bundle lying beneath the membrane, and in the majority of our pictorial representations, this is clearly in evidence.

Tumors springing forward from the vesical mucous membrane are, in most instances, papillomata. Their plastic effect in the field of vision is enhanced, in most cases, by a floating about of papillomatous shreds or tufts in the bladder fluid. The condition is so characteristic that error in diagnosis seems scarcely possible—provided that the remaining portion of the bladder wall be covered with normal mucous membrane. The sharp reflex light causes the ends of the papillomatous tufts to appear, commonly, white with a tint of delicate rose. The tufts may be long and branching or shorter and wart-like. The entire tumor may consist of these villi, or, it may give the impression of a solid mass covered over with tufts. The aspect of a pure papilloma is depicted in Figs. 40, 41, Plate XVIII., where the growth (about the size of a walnut) is composed of villi alone, is attached by pedicle to the left uretral area, and rises, distinctly natant, from an intact vesical parietes. Likewise in chronic inflammation of the vesical mu-

cous membrane (shown, in the figure by augmented redness and by the indistinctness in contour of the background) the long white villi are sufficiently prominent in the visual field. In Figs. 46, 49, Plate XXI., are depicted isolated portions of the margin as seen in the cystoscopic field with the prism at greater or less distance. The floating neoplasm, of the size of a small

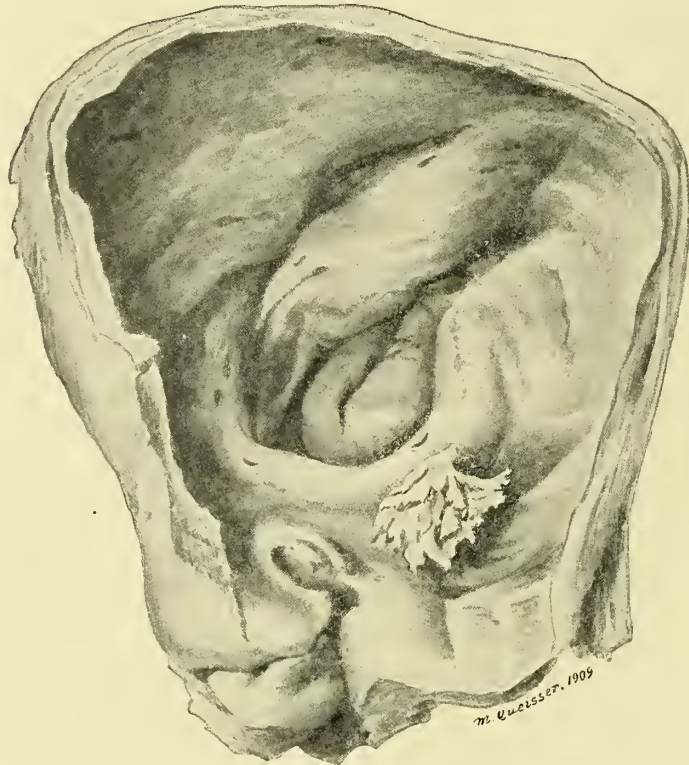


Fig. 10. Pediculated, benign papilloma in the region of the left ureter.

(From the Royal Clinic Collection.)

apple, is positively papillomatous, and attached to the fundus in the region of the left uretral ostium by a pedicle, both ostium and pedicle being hidden beneath the mass of the overhanging tumor.

If tissue-necrosis, ulcerous disintegration and hemorrhage occur, the cystoscopic findings become

manifold and often difficult of interpretation. Coagula of blood and fibrin and shreds of epithelial tissue may then occupy the entire foreground of the cystoscopic field. Where there is continuous slight hemorrhage, the blood coagulum adherent to a villus may steadily enlarge, become organized, and, as a pseudo-tumor, deceive the observer.

Such phenomena are seen in Figs. 43, 45, Plates XIX. and XX. Since it is not a question here of bladder infection, the objects viewed gain in entirety if compared with previous findings. In the first figure we note, rising from a normal yellowish-red mucous membrane, (which, because of muscular hypertrophy is thrown into more prominent rugæ than usual) a spheric, reddish-brown tumor of perfect plastic clarity, whose overhanging free margin indicates pediculous attachment. Its surface exhibits a peculiar yellowish-brown granulation, shown by closer observation to be a delicate incrustation and hence more strongly reflective of light. Because of this, the free margin appears denticulated. If we examine further the periphery of the growth, apparently the size of a small apple, portions are found of entirely different aspect, *i. e.*, essentially papillomatous. Like white octopoid arms the villi enclasp the solid tumor which forms much the greater portion of the neoplasm.

In a growth surgically removed, it was found impossible to separate the big, stone-hard coagula of blood from the villi, and section demonstrated complete encapsulation of isolated villi by the organized and calcified coagula. Histologic diagnosis: benign papilloma.

In regard to tumor dimensions, it is well known that cystoscopic data may easily lead to illusions. Objects seen in the field appear, naturally, so much the larger

the more they project into the cavity of the bladder. Often in a single field, magnification and its antithesis may simultaneously occur, for example, when the field is located on the margin of a prominent tumor. For this reason, the tumor in some of our views rather exceeds its natural dimensions. If accustomed to the use of an optical apparatus, slight errors of this nature are easily avoided. The rule in determining size is to keep the prism as far as possible from the object in order to view synchronously larger areas of the bladder wall. Where a tumor is so small that it may be seen in its entirety in a single field, estimation of its size is not difficult. The larger the tumor, the more uncertain the data in this regard. With pure papillomata, however, the illusion is short lived. If, after opening the bladder by *sectio alta*, the irrigating fluid is drained off, the papilloma collapses like a jellyfish on a hot stove lid. Localization of the growth likewise comes under the rule of size, *i. e.*, the smaller the tumor, the more exact its localization. (Cf. Fig. 40, Plate XVIII.)

In a case where left-sided renal colics had led to the supposition of renal stone and a fruitless splitting of the kidney, I was able to locate, in the left half of the trigone on the floor of the bladder, a papilloma the size of a hazel-nut which had caused compression of the uretral meatus.

Tumors of greater size in the fundus vesicæ may cover one or both of the uretral openings, so that the apparent exitus is, perhaps, far removed from the ostium. The same may be the case with a larger and pediculated growth having its point of origin in the anterior or lateral wall and projecting out into the fundus. In rare cases only is it possible to gain a cystoscopic glimpse of the pedicle, to determine its

proportions, whether large or small—difficult data to obtain because of the overhanging, fungoid margin of the tumor.

Multiple papillomata are often found on the vesical mucous membrane; hence, one should not be content with the demonstration of a single papillomatous tumor without careful examination of the remainder of the bladder wall. Cystoscopic investigation offers here a better view than that given by direct observation of

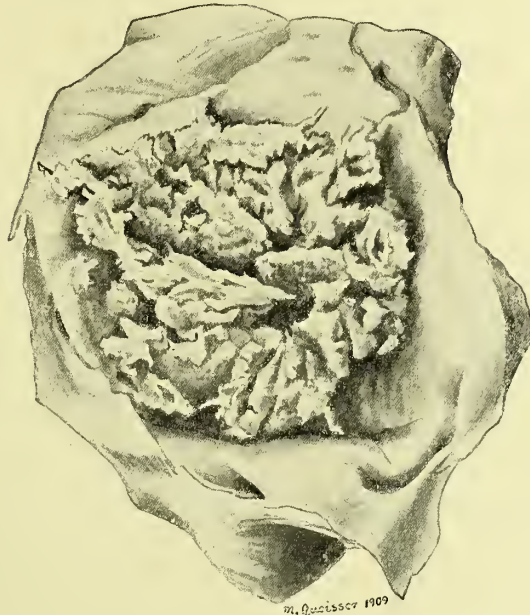


Fig. 11. Carcinoma medullare vesicæ urin.
(From the Royal Clinic Collection.)

the bladder after it has been opened *in vivo* by a *sectio alta*.

Positive reply to the question whether the papilloma be benignant or malignant, cannot be given cystoscopically, for, those familiar with the apparatus well know that a villous growth, though quite regular in superficial structure, may, more deeply, be atypic in growth and quite capable of infiltrating the bladder

wall. At any rate, there are always symptoms, which, in connection with the gross anatomic observations of the superficies, may be of value in one way or another. In general, the purer the papillomatous structure appears to be, the more probable its benignancy. If lumpy, irregular portions alternate with cauliflower excrescences, the more apt is its carcinomatous nature. A fairly certain indication of malignancy is the extensive disintegration of tissue.

Such variation in tissues entering into the structure of the neoplasm is noted in Figs. 52, 56, Plates XXIII. and XXIV., an interesting vesical tumor found in a workman employed in the manufacture of anilin stuffs.

First, an alteration of the mucous membrane *in toto*, vividly red and tumefied, as evidenced by its turbidity and the dim outlines of the blood-vessels. In some places in the vicinity of the greatly distended vessels, extravasation of blood has occurred (Fig. 53). It is a picture of hemorrhagic cystitis. In the fundus of the bladder there is a tumor about the size of a hen's egg, the separate marginal portions of which are shown in the five views. In Fig. 56 it is depicted as an irregular, lumpy tumor, distinct and prominent, with a somewhat overhanging edge. The left portion of the visual field clearly exhibits some neoplastic nodes whose summits are strongly reflective of light and hence appear more brilliant. The second view, because of extensive necrosis of the superficial layer, has a whitish, defibrillated appearance, and the furrow running medially shows exudation of blood into the tissues. Several such hemorrhages are seen at the margin of the tumor in Fig. 55, and here the tumor *in toto* appears paler, whiter. Its free edge rises sharp and plastic from the mucous membrane, whilst in Fig. 52 its marked papillary character is evident. The short

villi of the cauliflower-like neoplasm are seen distinctly, floating in the bladder contents. Figs. 53, 54 demonstrate the line of contact between the solid tumor and the mucosa. In the first figure its almost imperceptible transition into mucous membrane is seen, from which it is difficultly differentiated by its color and gradual elevation. Its boundary approaches closely the left uretral ostium—visible in the last view—the right ostium being free.

The occurrence of vesical carcinoma among anilin workers has been reported frequently of late years. I have two patients, employed for years in an anilin factory, who came under observation because of hematuria. In one of them the cystoscope revealed a marked hemorrhagic cystitis but no trace of a tumor. The second patient had a carcinoma vesicæ like the one described above. The fact, that with him also there was bleeding from a mucous membrane completely inflamed, is rather indicative of injury caused by the same noxa. What connection there may be betwixt the genesis of tumor and a chronic anilin intoxication is yet to be elucidated. Probably we have here a state of chronic irritation favoring the development of new growths.

The patient, who, after the operation, was earnestly warned to abstain from factory work, went back to his old position as foreman. Seven months *post operationem* new hemorrhages began. Cystoscopic examination showed a flat surface of neoplastic relapse together with the gravest cystitis hemorrhagica, the patient succumbing a few months later.

Worse than the protuberant forms are the neoplasms *ex mucosa*, scarcely rising above the plane of the vesical mucous membrane, *i. e.*, flattish growths, as shown in Fig. 59, Plate XXVI.

The tumor, palpable from the abdominal surface, lay in the vertex of the bladder more toward the anterior wall. Cystoscopically, it apparently covered an area equal to that of a silver dollar, a crateriform ulcer with greatly swollen edges and a base tuberculated and lumpy, covered with necrotic shreds of tissue and fibrin coagula. The wall-like elevation of the margins is vividly depicted in the figure. Elements of decision in the cystoscopic diagnosis were: the development of this single ulceration in an otherwise intact vesical mucous membrane; the rounded, somewhat abrupt demarcation shown by the wall-like margins, giving to the totality the appearance of a unitary neoplasm with a central point of genesis, extremely like that of a carcinomatous ulcer developing in any mucous membrane.

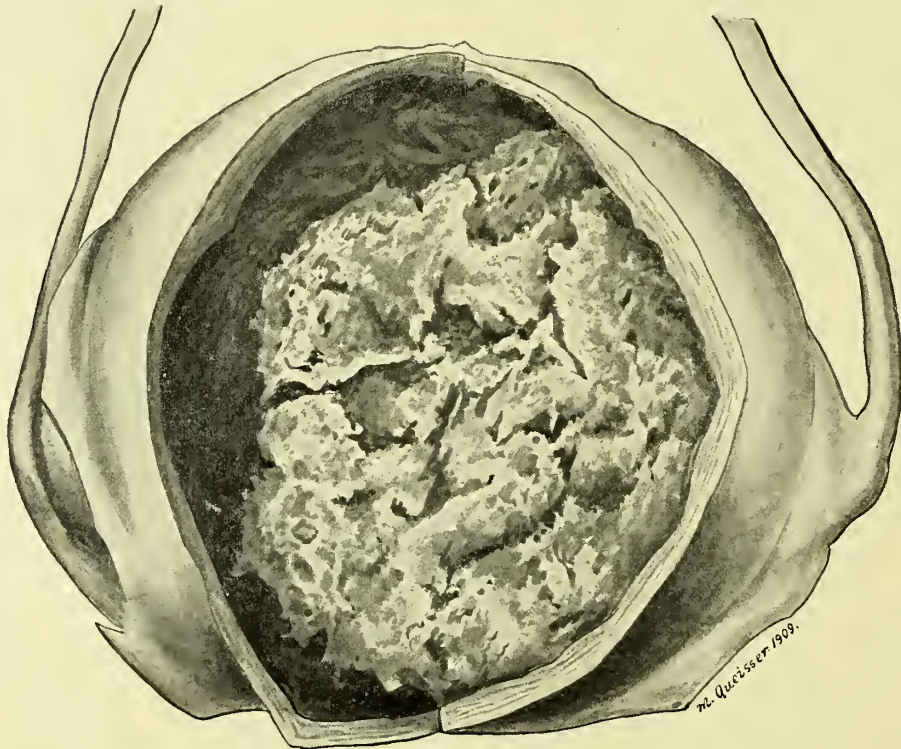


Fig. 12. Large carcinoma papillomatosa of the bladder.
(From the Royal Clinic Collection.)

If ulceration of the superficies of tumors sets in, a more or less violent vesical catarrh is commonly the sequela, rendering a cystoscopic diagnosis extremely difficult, often impossible, and, in the case cited, successful only when irrigation had gradually eliminated the more serious cystitic phenomena.

When tumors have the deeper strata of the bladder wall as points of origin, the cystoscopic appearance of these submucosal growths is characteristic. Confusion with new growths in adjacent organs, causing a bulging inwards of the vesical parietes, might occur under

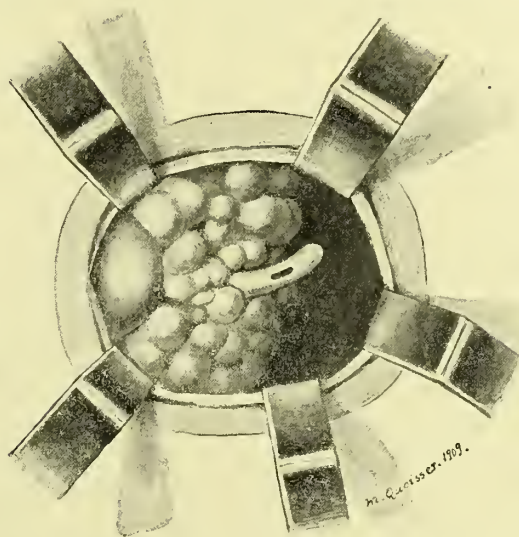


Fig. 13. View, taken during operation, of the bladder opened by *sectio alta*. Surrounding the catheter are the new growths. For the cystoscopic data *vide* Figs. 50-51, Plate XXII.

certain conditions, though commonly such growths cause the protrusion of greater areas of vesical surface into the cavity of the bladder; whilst tumors originating in the musculature of the bladder itself are more sharply delimited and coherent with the bladder wall by means of pedicles.

Relatively, the most common of the new growths with origin beneath the connective tissue of the blad-

der wall, are the sarcomata. I have been able to observe two such cases of sarcoma; one operated by *Kümmell* a few years ago, the other recently in the Royal Clinic. In the latter case it was possible to obtain a diagnosis by the cystoscope before operating.

The cavity of the bladder was materially diminished in volume by a large and prominent tumor, apparently having its point of origin on the anterior vesical wall. Its surface was smooth and covered by mucous membrane in which the blood-vessels were distinctly seen. The cystoscopic image had a certain similarity to the appearance of a single, markedly projecting prostatic lobe. The tumor seemed to be plainly spheric with overhanging free edges. The fundus was free and likewise the posterior and the superior walls, save where they were hidden by the protruding new growth. In one place alone, at the summit of the tumor, was the mucosa defective. The deficiency in mucous membrane covered an area about as large as a cent and was replaced by shreds of necrotic tissue, floating debris and coagula of blood.

Sarcoma, fibroma, myxoma and their mixed forms may be found in the bladder during the first years of life. Figs. 50-51, Plate XXII., show an interesting collection of multiple myxofibromata in the vesical cervix of a boy, *æt.* three years. Surrounding the internal opening of the urethra, we see a conglomeration of spheric, pediculated tumors covered by the mucous membrane. During life these new growths are rarely observed. Clinically—as in the case just noted—they incline to a retention of urine, for their favorite location is at the vesical cervix; hemorrhage is infrequent because of the submucous site. In my case I was able to extirpate the tumor by *sectio alta*, with excellent results.

The same practical significance attributable to cystoscopy in the diagnosis of new growths in the bladder, is likewise valid in denoting the operative method best suited to the case.

There is no doubt that endovesical removal is a useful method, where we are dealing with small, pediculated papillomata, for the surgeon acquainted with the technic of the operation. Its advantage lies in the minimal disturbance caused; its disadvantage in that total extirpation is difficultly accomplished. In all sessile tumors with broad base, but particularly with tumors of large dimensions, the *sectio alta* probably opens up the operative field in the great majority of cases.

Hypertrophy of the Prostate.

In hypertrophy of the prostate gland, cystoscopic examination plays a very important practical rôle. The cystoscope confirms clinical findings, shows whether the symptoms present (possibly due to some accidental morbid condition along the urinary tract) are conditioned by the enlarged prostate alone, and directs the surgeon in his choice of an operative path. Formerly, prejudice against the use of this instrument was general—and in part is prevalent even now—first, because of the danger; secondly, because of the lack of data furnished by it. As to the first objection, the danger of wound or infection is avoided by proper technic and insistence upon the strictest aseptic measures. I note, too, that the cystoscope most easily finds the way, often so difficult, along the lengthened and devious urethra of the prostatic patient; and in many cases where a false passage already existed, I have been able to introduce the large-calibered irrigation cystoscope without difficulty. The second objection will be disposed of by the following data:

It scarcely needs mention that the diagnosis of hypertrophy of the prostate may be established in most cases without the use of the cystoscope. Very often, however, there is justifiable doubt as to whether the symptoms present are due to prostatic hypertrophy

alone. Accentuated hemorrhage will, above all other symptoms, demand the use of the cystoscope. If in such a case, examination is made during or immediately after the bleeding we are, conditionally, able to see the blood oozing from the prostate, or to discover the traces of fresh hemorrhage in extensive sugillations in the mucous membrane covering the gland. If, however, the prostate be quite intact, it is probable that the source of the bleeding is elsewhere, and either of vesical or renal origin. Thus, in the case of a prostate patient seen recently, who had been suffering with marked hematuria, I found two small papillomata the size of raspberries in the fundus of the bladder. In another case the bleeding continued after transvesical extirpation of the prostate; it was due to a malignant renal tumor.

The frequent combination of concretions and prostatic hypertrophy we shall consider pictorially.

The image of the prostatic bladder furnished by the cystoscope is characterized by the muscular hypertrophy of the wall, always present and due to the difficult passage of urine. A glance at the vertex of the bladder, as shown in Fig. 7, Plate III., demonstrates the *vessie à colonnes*. Together with the trabeculated bladder we often find a formation of diverticula, as before mentioned. The enlarged prostate itself presents an unusually variable picture, according to the site and growth of the single parts of the gland. The totality of the pathologic variation consists in the presence of a solid neoplastic growth in place of the smooth fold of mucous membrane encircling the normal orificium internum. Whether the abnormal tumefaction encircles the urethral opening; whether it projects, tumor-like, into the cavity of the bladder, or exhibits a tendency to infiltration; whether, structurally, there

are revealed symmetric halves bound together by a median commissure; whether in place of this last there is seen a median swelling which attains a considerable periphery, a single spheric or pediculated lobe hiding the entire field or, whether wholly asymmetric tumoral nodes surround the urethral orifice, giving an appearance similar to that of a hilly landscape—all these conditions are quickly demonstrable with a few turns of his instrument by the technician.

Figs. 60, 64, Plates XXVI.-XXVIII., present various cystoscopic views of prostatic hypertrophy. The well-known picture of the symmetric side-lobes is seen in Fig. 61. From each side of the visual field projects a globular tumor, covered over with a smooth mucous membrane. They rise plastic from the deeper-lying and, therefore, darker-appearing vesical wall, whose traces of trabeculæ are still plainly visible. The deep furrow between the prostatic halves is filled with a floating coagulum of blood hanging down in the vesical cavity. The blood-vessels in the mucosa covering the tumor are in part vividly injected, and along their course, extravasation of blood into the tissue is noted.

Likewise extraordinarily conspicuous is the margin of the greatly hypertrophied prostate, seen in Fig. 62, Plate XXVII. Like a genuine neoplasm it projects overhangingly into the trabecular bladder, whose single trabeculæ delimit diverticuloid bulgings of the vesical parietes. The surface of the prostate is not entirely smooth but rather somewhat protuberant. The mucous membrane is intact, but to it some mucous threads are adherent. The picture remains approximately the same, despite the various indentations of the margin. Single lobes are not demonstrable cystoscopically, but the prostate, in the form of a globular

tumor the size of a small apple, takes its place in the vesical fundus.

Similar in essentials, is the free margin of an extremely hypertrophied prostate pictured in Fig. 64, Plate XXVIII. The surface is distinctly undulated and covered over by smooth, intact mucous membrane. The best illuminated—because the most prominent—portions have a whitish-yellow appearance. The tumor overshadows a large area in the fundus, and the uretral openings are not to be found. The vividly red mucous membrane (darker in the picture) appears to the observer as widest posteriorly, and is plainly trabeculated. Another view (Fig. 63) shows the edge of the same prostate nearly in the median line. In a deeper furrow of the prostate a coagulum of blood and whitish masses of fibrin are found, due to a lesion or necrosis caused by the pressure of a permanent catheter. The appearance of a prostatic carcinoma is shown in Figs. 65-66, Plate XXIX.

A small polypoid tumor, somewhat magnified by bringing the prism unusually near, is seen in Fig. 60, Plate XXVI. On the free margin of a diffuse, dense tumefaction of the prostate is located a distinctly pediculated spheroid tumor about the size of a small hazel-nut and covered with a smooth, bluish-tinted mucous membrane. Behind it lies the reddened vesical mucosa, within the folds of which are some dilated blood-vessels whose dimness of contour indicates an edema of the mucous membrane.

The case was that of a patient, *æt.* eighty, who came to the clinic because of retention of urine. Irrigation rapidly dissipated his troubles, so that, on account of poor general condition, operation was not thought of.

Elevations, irregular in contour, and also vesical concretions are shown in Figs. 73-74, Plate XXXIII.

Fig. 74 exhibits a very prominent, tongue-shaped lobe projecting like a uvula into the vesical cavity. Behind the prostatic swellings which push forward from the right and left toward the median line, like the side scenes (coulisses) of the theatrical stage, we see the bladder wall, which because of its folds, is not uniformly illuminated and hence appears varied in hue. In the niche formed by prostatic swelling and between the middle and right lateral lobe, lies a round stone, about

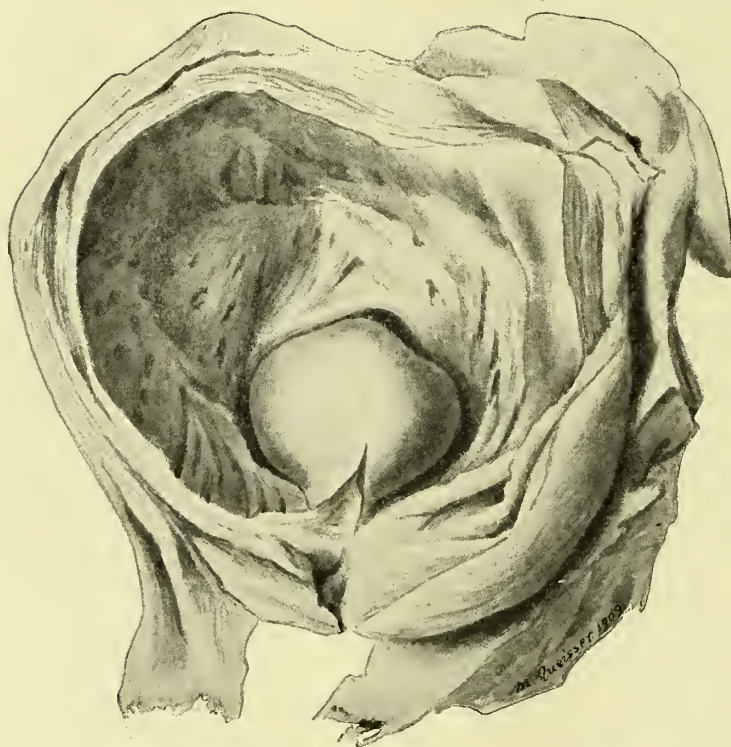


Fig. 14. Middle lobe of the prostate.
(From the Royal Clinic Collection.)

the size of a hazel-nut and apparently of an olive-green tint, whose apex or summit is still clearly visible. In the fundus a second and much larger stone, freely mobile, is observed. In Fig. 73 it lies up against and upon the right lateral lobe of the prostate, so that its

free edge serves as boundary to the diverticuloid area. The surface of the calculus is rough, its margin denticulated, its color yellowish-brown with some portions whitish. It is about the size of a hen's egg.

Pictorial reproduction of the individual forms of

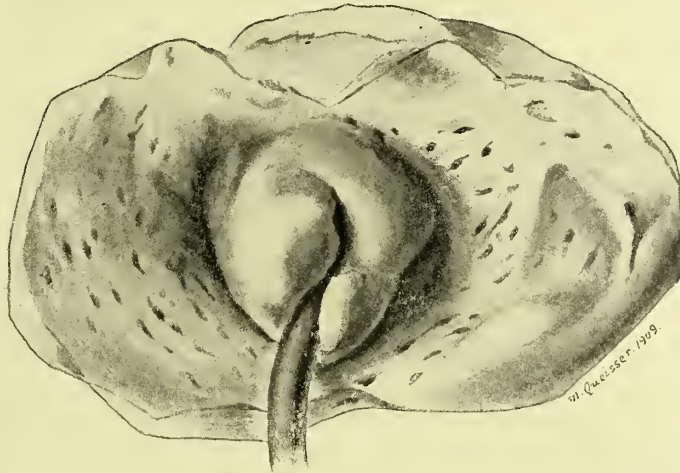


Fig. 15. Hypertrophy of the prostate. Marked projection into the bladder.

(From the Royal Clinic Collection.)

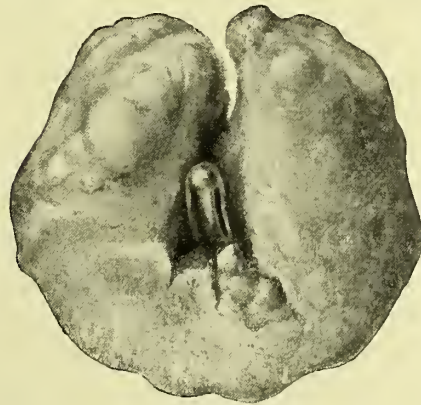


Fig. 16. Enucleated prostate

prostatic hypertrophy is rendered difficult by the relative smallness of area possible to get into each cystoscopic field. Observation of the views, in succession or continuity, alone permits conclusions as to the actual

site and size of the prostate, conclusions arrived at *in vivo* by turning the instrument in various directions.

For the surgeon planning his operative procedures in accordance therewith, this totality of anatomic change which thrusts the hypertrophied prostate upon the vesical neck is of the greatest importance. Primarily, there must be accurate differentiation betwixt the types actually projecting, like true tumors, into the cavity of the bladder, and those of little prominence, annular, and located about the orifice and posterior

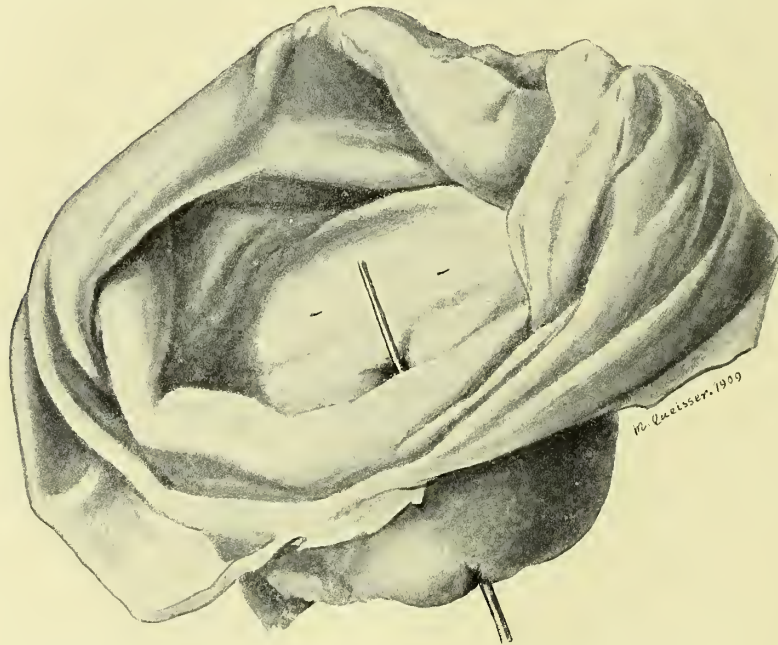


Fig. 17. Prostatic hypertrophy of slight vesical prominence.
(From the Royal Clinic Collection.)

portion of the urethra. Those of the first variety appear, cystoscopically, in full plastic lucidity as tumors of greater or less size, sometimes occupying the major portion of the vesical fundus. It does not seem advisable to remove them *via* the longer perineal route. They should be classified rather as vesical tumors and extirpated by *sectio alta*. In my opinion, this indication

should be most strictly valid when we have an overgrown middle lobe only, occluding the urethra like a valve. But the lateral lobes also, if they protrude sufficiently into the bladder, are most easily removed by the suprapubic route; in other words, the greater the intravesical development the easier their complete extirpation from above. Fig. 16 of the text shows the type of such a prostate removed *in toto* by the superior route.

Much more difficult, in my opinion, is extirpation by *sectio alta* of the forms but slightly elevated above the plane of the vesical surface. The point of attack for the decapsulating finger is here lacking. If hypertrophied prostates of this order project markedly in the direction of the rectum, then perineal extirpation is the indicated method.

If, however, the enlarged gland takes rather the form of a dense, infiltrating ring about the urethral opening, or, if it be of the small, shriveling-up type, I consider a Bottini cauterization indicated, for, the smaller and denser the prostate the more difficult its complete extirpation.

Concretions and Foreign Bodies.

Confirmation of the diagnosis of vesical calculus is indubitably—disregarding the X-ray method—obtained most comfortably, and, above all else, most unobjectionably and accurately by the employment of the cystoscope. Confusion with incrustations possibly present on the ulcerated vesical wall and upon tumors is not always avoidable where the calculus sound is used, whilst the cystoscope gives full information as to the species and nature of the concretionary formation. Of even greater importance than demonstration of the size and number of calculi (concerning which the Röntgen light gives equally reliable data) is the determination of their sites and their relations to the bladder wall. Only direct observation by means of the cystoscope gives complete information whether the stone lies loose in the fundus; whether it is hidden among the folds of a mucous membrane swollen from inflammation; whether a genuine diverticulum or the bulging out of a trabecular bladder partly encloses it, or, if caught in a recess behind the prostate, it eludes direct contact with the vesical sound.

If the bladder be aseptic, or if there are few inflammatory phenomena in the mucous membrane, the cystoscopic recognition of a calculus is so simple that even the clumsiest of operators can have no doubts as to the diagnosis.

Figs. 67-70, Plates XXX and XXXI., illustrate such conditions. The slightly inflamed mucosa is somewhat redder in hue than usual, its blood-vessels are correspondingly dilated and their outlines present a rather washed-out appearance; other details, however, *e. g.*, the delicate folds of the mucous membrane, are clearly recognizable. In full plastic distinctness the two calculi rise above it. Their chalky color, their smooth surfaces identify them as phosphatic—in so far as an observer at the periphery may judge of the structural components of calculi. In accentuation of their physical characteristics, the shadows cast in the intravesical illumination are peculiarly useful, as, for example, the shadow cast upon the vesical wall by the tip of the retort-shaped calculus. This apical portion, which projects freely into the cavity of the bladder, is shown to be discontinuous with the whole calculus and rather separated from it by a corset-like constriction. The connecting link, free from concretions, gives one the impression of a foreign body. Section of the stone, removed suprapubically, showed the nucleus of the longer calculus to be a piece of straw, that of the oval one a bit of wax. (Fig. 18 of the text.) In Fig. 75 the discolored area still visible corresponds to a fibrinous deposit whose apex or point shows commencing incrustation. The cause of this circumscribed deposit was a decubital ulcer.

Another essential factor in calculus formation is seen in Fig. 77, Plate XXXIV. The margin of this stone, fully as large as a pigeon's egg, has a yellowish-brown tint, the whitish appearance of some areas being due to the brilliant light reflex. The surface is rough and in some places furrowed. The calculus, far from being freely mobile, is rather embedded in the markedly puffed-out mucous membrane, and its site corresponds

to the neck of the bladder just behind the moderately enlarged prostate. Whilst this fixates the stone anteriorly, it is also encircled by rolls of hypertrophied mucous membrane in a state of violent inflammation, very swollen, puffed up and red, and without a trace of vascularity.

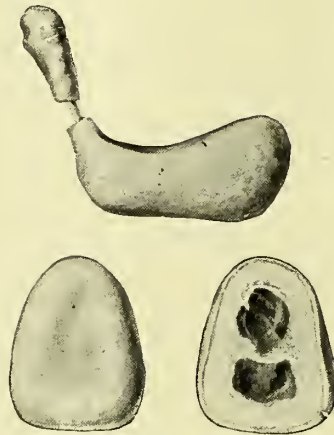


Fig. 18. Concretions with a piece of straw and a bit of wax as nuclei

After opening the bladder by *sectio alta* it was necessary first to loosen the concretion with dressing forceps before extraction was possible. The stratified stone

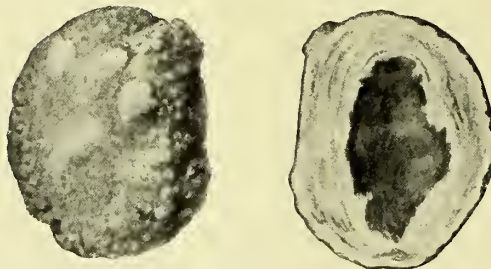


Fig. 19. Calculus with a piece of wax as nucleus.

was composed of urates and phosphates surrounding a nucleus of wax.

The larger the calculus, the more difficult the estimate of its size. With extremely large concretions,

often filling the entire fundus, the use of the cystoscope often becomes impossible. In such cases it is frequently difficult to get the edge of the calculus in such posture that portions of the bladder wall are seen simultaneously. In Fig. 76 such a stone, larger than a hen's egg, is depicted, which in the cystoscopic view occupied the major portion of the visual field.

The imbedding of a concretion in the cervical region of the bladder has been shown in the views previously alluded to, *viz.*, Figs. 73 and 74, Plate XXXIII. A round, olive-green stone the size of a hazel-nut lies in a recess or niche between or rather behind the middle and lateral lobes in such manner that only its top or apex is visible in the cystoscopic field. A second, much larger stone is freely mobile in the fundus, and in Fig. 73 this stone lies over the lateral lobes of the prostate. The views show the alterations in *relief* by changing the position of the prism.

From these and previous views we gather the significance of cystoscopic examination in affording data for a choice of operative procedures. Only direct observation with a cystoscope permits decision of the query whether the calculus is to be disposed of by lithotripsy or whether in its removal an opening of the bladder is necessary. If the first method, lithotripsy, be chosen for the freely mobile stone, capable, also, of perfect disintegration, the cystoscope is still of value as a control to determine whether the debris has been entirely removed or not.

In the diagnosis of foreign bodies in the bladder the cystoscope is of unique value; facts undiscovered by the Röntgen ray or the sound are rendered visible by the cystoscope.

Concerning the difficulties, which, because of inflammation of the mucous membrane of the bladder, greatly

hinder cystoscopy, they have been considered in the chapter on cystitis. The severest forms of inflammation are often due to the prolonged stay of infective foreign bodies.

Interpretation, therefore, of cystoscopic findings where a foreign body is present, is not always as simple as it seems. Even when the foreign body is plainly visible, error as to its dimensions easily creeps in, for the optical apparatus under certain conditions is capable of materially altering the contour of objects found in the cavity of the bladder. Knowledge of such data is of practical value also in the question of extraction.

Furthermore, foreign bodies tend to rapid incrustation, thus altering their shapes. It is well known that a great number of vesical calculi have foreign bodies as nuclei.

If we are dealing with known or familiar objects, which—and this is commonly the case—have found their way into the bladder *via* the urethra, their recognition is rapid. Broken-off catheter tips, needles, thread, nails, splinters of wood, straws, etc., etc., are the commonest objects. It is quite otherwise when these addenda to the economy are less familiar and the patient, as is so frequently the case, remains garbed in silence. One must be prepared to encounter the incredible in his vesical wanderings—objects whose dimensions, apparently, need bear, in relation to the lumen of the urethra, only a partial or, at the most, approximate correspondence. Moreover—at least with the material presenting itself at the Royal Clinic—such findings are as often discovered in males as in females, their unnatural lusts having forced these extraneous objects through the urethra into the bladder.

Extremely puzzling were the cystoscopic findings



separated from a young man with an acute and most painful cystitis. The vesical mucosa was vividly red and swollen, and in the fundus there was seen an apparent tumor, irregularly cylindric in form, of about the size of a small hen's egg, appearing to be soft and spongy in structure and dark-brown in color, reminding one of a melanotic growth. The next day the patient, by forced draught, was able to pass urine and a sausage-shaped mass, which latter, carefully investigated, turned out to be a roll of chewing tobacco.

Less difficult of recognition was the extraneous object forced into the urethra by a man, *æt* fifty. He had taken one of the wooden handles or grips which are put on packages for their easier carriage. The string was left attached to this overgrown bougie so that it might be withdrawn. It had, nevertheless, slipped into the bladder and taken a transverse position across the orificium internum, so that extraction by means of the cord was impossible. Forceps inducted *via* an external urethrotomy removed it.

Other cases—a hatpin, 20 cm. long; a piece of paraffin about which a calculus had formed; a stalk of straw (*vide supra*); a leadpencil with metal casing—all found in the urinary bladder of the male sex, decorate our statistics for the last few years.

Of foreign objects passing spontaneously from adjacent tissues into the bladder, silk ligatures are the most common and their cystoscopic recognition is not difficult. They incline, as is well known, to incrustation, and this process may be completed in a very short time.

Post operationem addenda, such as tampons, sponges, even the operator's instruments may be demonstrated cystoscopically (*Stöckel*) after they have succeeded in perforating and entering the bladder.

Just as in the recognition of foreign bodies, so in the matter of therapy, cystoscopic examination furnishes the elements of decision. He who understands the use of the cystoscope as well as operative procedures will be able to educe many foreign bodies *per vias naturales*, and, in particulate, from the female reservoir. On the other hand, curved, rigid, pointed objects whose removal through the long urethra of the male would probably inflict much injury are taken out by a bloody vesical incision or in certain conditions by an external urethrotomy.

Wounds of the bladder are rarely cystoscopic, for the perforated organ collapses and cannot be restored by means of irrigating fluids, air or gas.

Surgical lesions of the vesical wall commonly present, after healing, few noticeable changes in the cystoscopic field. As long as there is delay in the formation of a firm cicatrix after *sectio alta*, the granulations seen on the superficies of the wound might impress the observer as neoplastic. Older scars in the vertex appear as whitish, scarcely perceptible lines.

Testing Renal Function.

Knowledge of the morbid conditions present in the urinary bladder does not exhaust the practical surgical significance of cystoscopy; the great field of renal pathology gives it scope for most productive activity. The progress of modern surgery of the kidney is indebted to cystoscopy in no slight degree.

Two essential demands are made of cystoscopic investigation where disease of the upper urinary tract is suspected: 1) Demonstration of the kidney affected: 2) judgment of the quality of the other kidney. Upon these data are based diagnosis and the indications for surgical interference.

To what degree one is justified in concluding from pathologic changes in the mucous membrane of the bladder that the kidney is diseased has already been sufficiently discussed. The next in order was a demonstration of what might be learned by direct cystoscopic observation of the urine as it flowed from the two uretral orifices.

So far as observation of the rhythmus of uretral discharges is concerned, it should be borne in mind that the single intervals between uretral contractions may be of various lengths without necessitating pathologic disturbance of secretion. If comparative observation for some time of both uretral orifices shows a visible retardation of rhythmus and slow contraction on one side, a suspicion at least of disturbance of function in

that kidney may be entertained. Of considerable import also is an absence of uretral micturition on one side whilst the other continues in normal function.

In general, one should be sceptical of conclusions based only upon observation of the uretral orifices in active function. Slight turbidity of the urine may likewise be disregarded, particularly where cystitis is present, and, furthermore, it is beyond ocular judgment, whether the urines ejected from the two sides be of like degree of concentration. Uretral contraction is merely a visible sign of voiding the secretion and tells nothing of its quality. An intermittent hydronephrosis may, quantitatively, be as active as a healthy kidney and its uretral contractions quite as frequent—though the degrees of concentration of the two urines are anything but similar. I have demonstrated like conditions in fistulous kidney.

If the mixture of pathologic components with the urine is so marked as to be perceptible in the slender stream of uretral micturition, even the simple cystoscopic observation may afford sufficient evidence. Extremely beautiful pictures are often seen. Thus a pyonephrosis will occasionally eject a purulent urine whose discharge from the uretral orifice into the bladder may be compared to the smoke from a cannon's mouth; discharge upon discharge, the purulent flecks dancing about in the whirlpool of fluid, continue until the field of vision becomes turbid with them. Fig. 79, Plate XXXV., shows a urinary stream of this character continuing until its density throws a shadow upon the parietal mucous membrane of the bladder. In the interim, there frequently issues a sausage-shaped mass of pus.

If there be renal bleeding, the thoroughly mixed urine and blood ejected from the uretral orifice looks

like smoke from a chimney, fading away as soon as it strikes the open air. Long sausage-shaped coagula of blood also may be seen hanging out of the urethral orifice, floating about in the vesical liquid. Recently I saw, several days after renal operation, coagula of old, stagnant blood, like black pearls. (Cf. Fig. 80, Plate XXXV.)

Fig. 81, Plate XXXVI., shows how tumor masses may be expelled from the urethral tube into the bladder. The case was a large hypernephroma perforating the renal pelvis and filling it with the yellow-whitish neoplastic masses. (Cf. Fig. 20-22 of text.)

In all such cases the separation of the pathologic material may be actively helped by a bimanual palpation of the affected kidney.

Unfortunately, however, all these cystoscopic observations are not constantly available and helpful; there are a great number of renal conditions whose existence is not indicated by changes in the correspondent urethral orifice or in the stream of urine issuing therefrom.

Attention, therefore, was directed toward the perfection of numerous methods for investigating functional power, methods of extensive, successful application. We must learn, however, to appraise correctly the worth—and the limitations—of these functional methods. Occasional failure of the method—the fate of every testing of function—is no evidence of its practical worthlessness. The phloridzin test, formerly often used, has, despite its reliability, the disadvantage of a certain delicacy in execution, also characteristic of the test for determining the degree of electric conductivity of urine. As an extremely practical and, above all, simple method, the chromatic test of *Völker* and *Joseph* has demonstrated its value, particularly

where it is necessary to gain immediate information of the functional powers of both kidneys. A positive result is decisive; a negative merely indicates the employment of other methods.

Because of many years' experience, I consider bi-uretral catheterism as the most thorough and reliable method, for it alone adds to the testing of function a determination of the pathologic content in each renal secretion. And as the ergistic abilities of the two kidneys are ascertained by comparing cryoscopically the molecular concentration of the urines passed, so the pathologic renal changes are demonstrated by the chemical, microscopic and bacteriologic examinations of renal secretion.

In my opinion, no other method of determining function surpasses cryoscopy in the accuracy of its results. Both its principle and its application are relatively simple. It depends essentially on the fact that, when renal function is normal, the concentration of the blood (Δ 0.56) is constant. A rise in the degree of concentration of the blood indicates insufficiency of the entire uropoietic tract, an item of great importance where a nephrectomy is under consideration. As a means of comparison, cryoscopy of the urine is also valuable. We know that a pair of normal kidneys produce, synchronously, urines which approximately are of equal molecular concentration. If there be disturbance of function in one kidney, its urine will contain fewer molecules in solution than the urine simultaneously secreted by the other kidney. Hence, comparison of the degrees of concentration informs us as to the synchronous participation of each kidney in the removal of the nitrogenous end-products of metabolism. Numerous trials have demonstrated sufficiently the utility of the method. To employ it we need, how-



Figs. 20, 21. Hypernephroma. The masses of tumor perforate and enter the renal pelvis, and are expelled through the ureter.

ever, simultaneous catheterization of both ureters, as it is a test of comparative values only.

As regards uretral catheterization the procedure cannot be avoided where we need to collect synchronously and separately the two renal urines, for it is the only method against which no objection can be raised. All of the more or less cleverly constructed

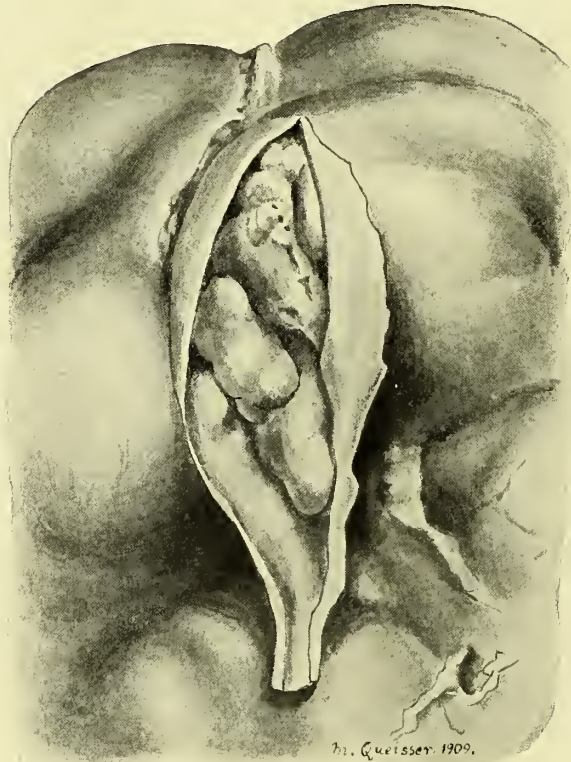


Fig. 22. Hypernephroma, the masses of tumor perforating the renal pelvis, are expelled *via* the ureter.

apparatus, having in view a separation of the urines after their entrance into the bladder, are unreliable in the results and data obtained. Aside from the fact that secretions from the mucous membrane of the bladder are mixed with the uretral urine, there will always be doubt concerning the perviousness to water of the

artificial separatory wall between the two portions of the bladder. From my own experience I can report many dubious results from such methods of investigation.

The question of justification for the uretral invasion by catheter or by sound should not be dubitable for the surgeon. It must be practised always when we desire a confirmation of diagnosis and indications for treatment. The method has had to overcome many prejudices, dating back to the period of its introduction into practice, when, on theoretic grounds, it was desired to quash the method before it had been sufficiently tested in practice; some unfortunate results also may have awakened suspicion of its value. Even to-day a contra-indication advanced by many is the existence of tuberculosis of the bladder. This, however, has no weight with the surgeon whose endeavor is early operative interference, for there are enough cases of extensive fundal vesical tuberculosis presenting no valid indication of primary renal involvement.

It is necessary to review the entire literature of renal surgery if we wish to demonstrate the use of methods of investigating renal function and uretral catheterism. The advantages of a practical use of these methods I have endeavored to detail from my own experience in various publications of earlier date.

Figs. 1-3.

The ordered arrangement of views in succession gives a synopsis of the normal vesical floor, obtained by turning the cystoscope from the region of the right ureter (Fig. 1) to that of the left (Fig. 3). Superiorly (in the figure), the mucous membrane appears in slight folds, radiating from the orificium internum urethræ, the blood-vessels taking a similar direction, whilst in the lower portion both folds and vessels run obliquely. The border line of both areas forms the ligamentum interuretericum (particularly well-marked in Fig. 2), whose beginning and end are shown in Figs. 1 and 3, in continuation of the uretral fold as it passes from above downwards and inwards. At its apex lie the slit-like uretral openings. In the lower portion of the visual field is the most posterior part of the fundus.

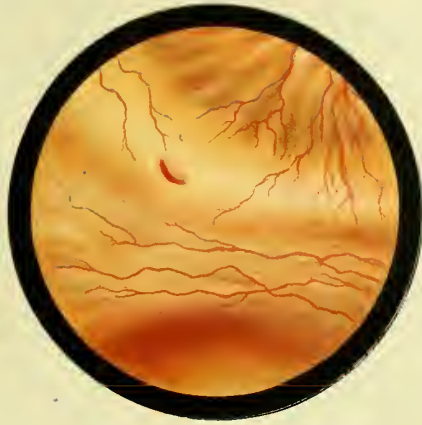
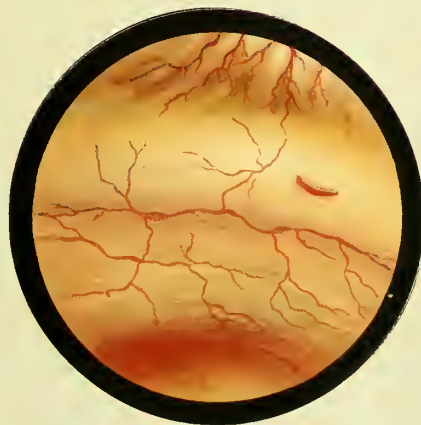


Plate I.

Figs. 1-3. Views of a normal fundus.



Figs. 4 and 5.

Accidental discovery in the bladder of an otherwise healthy man, *æt.* thirty. At the highest point of the left uretral fold two dimple-like ostia are seen, the peripheral one corresponding in its location with the right ureter, the other being near the cervix of the bladder. Catheters passed show identity of function in the two left ureters, and a skiagraph shows two uretral shadows up to the double kidney. (Cf. Fig. 18 of the text.)

Fig. 6.

Congenital diverticulum near the left uretral orifice in a boy, *æt.* three. The opening of the circular diverticulum appears black, the circumjacent mucous membrane shows radiating folds or rugæ, and the blood-vessels at the entrance of the diverticulum are seen bending outwards in their course.



Plate II.

Fig. 4 and Fig. 5. Double left ureter.

Fig. 6. Congenital diverticulum.



Fig. 7.

Trabecular bladder. Diverticulum in the vertex of the bladder of a prostatic patient. The entrance is not circular, but partially limited by the trabecular fold. The normal hue of the mucous membrane and the sharply defined contour of the blood-vessels demonstrate that no catarrhal conditions are present. In the lower portion of the visual field is seen the air-bubble, sharply reflecting the lamplight.

Fig. 8.

A portion of the lateral wall.



Plate III.

Fig. 7. Diverticulum in a trabecular bladder.

Fig. 8. Trabecular bladder.



Fig. 9.

Diffuse cystitis. Mucous membrane reddened but without luster. Outlines of blood-vessels indistinctly seen. Tough, very adherent layer of pus.

Fig. 10.

Fiery redness of the mucous membrane with a rolled-up coagulum of pus lying upon it.



Plate IV.

Fig. 9. Diffuse cystitis; a rug-like deposit of pus.

Fig. 10. Diffuse cystitis; a ball-like coagulum of pus.



Fig. 11.

Area about the neck of the bladder in gonococcal cystitis. Whilst low in the visual field near the orificium internum urethræ, the mucous membrane appears red and swollen; in the upper portion of the field the contours of blood-vessels are again visible. Near the border, gray-red blister-like elevations are more or less distinctly seen.

Fig. 12.

Grave cystitis, with hypertrophy of the prostate. The mucous membrane of the vertex is edematously degenerate.



Plate V.

Fig. 11. Bullous edema at the neck of the bladder.

Fig. 12. Bullous edema.



Fig. 13 and Fig. 14.

While the left uretral orifice (Fig. 14) presents a perfectly normal appearance, the greater portion of the mucous membrane of the bladder and also the right uretral opening (Fig. 13), lie within a reddened area, the washed-out aspect of which bespeaks an edema. In the periphery also of the visual field, the blood-vessels have lost the delicate, gracile appearance seen in Fig. 14.

The patient had tuberculosis of the right kidney.

Anamnesis: W., *æt.* thirty, locksmith. For about two years more frequent urging to urinate; later, burning on micturition; urine turbid. Kidneys not enlarged nor sensitive to pressure. Cystoscopically: Edema of the right uretral opening. After injection of indigo-carmin, prompt expulsion of blue urine on the left side; the right, negative.

Operation, June 16, 1908 (Prof. *R. Bier*): Extirpation of the right tuberculous kidney (a caseous cavity and solitary foci at the upper pole).

Cured.



Plate VI.

Fig. 13. Areolar redness and circumscribed edema of the right uretral orifice, with tuberculosis of the right kidney.

Fig. 14. Normal left uretral orifice.



Fig. 15 and Fig. 16.

A circumscribed edema about the orifice of the left ureter, with gaping of the orifice and redness of the prolapsed mucous membrane; also a washed-out appearance of the outlines of blood-vessels, with perfectly intact condition of the remaining mucous membrane of the bladder. Two days after examination small denticulated calculi were expelled.

Anamnesis: B., *æt.* twenty-four. Builder's apprentice. Last four weeks, complaints on passing urine which, according to patient, was bloody; lately there have been pains in the left inguinal region. Cystoscopic results shown in accompanying figures. The day after examination a violent attack of pain and the spontaneous expulsion of a small concretion whilst urinating.

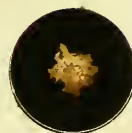


Plate VII.

Fig. 15. Circumscribed edema of the left uretral orifice
in a case of nephrolithiasis.

Fig. 16. Normal right uretral orifice.



Fig. 17 and Fig. 18.

Whilst the right uretral ostium (Fig. 17) shows normal conditions (likewise the other areas of vesical mucous membrane), the vicinity of the left ureter (Fig. 18) exhibits phenomena characteristic of tuberculosis in the upper urinary tract. The mucous membrane surrounding the left ostium is, within an area about the size of a half-dollar, extremely red and appears puffy. The uretral orifice gapes, looks spongy, and within the area characterized by edema, are numerous round or oval elevations from the size of a pinhead to that of a small lentil, and of which some look like nodules, others like ulcers. The case is one of tuberculosis of the left kidney.

Anamnesis: R, *æt.* twenty-seven. Employed in a help agency. For three years transitory attacks of bladder trouble. About a year and a half ago came for treatment because of a vesical catarrh; urine turbid; violent pain at every micturition. No pathologic lesion except the passage of purulent urine.

Operated Jan. 18, 1907 (*Rumpel*): Extirpation of the tuberculous left kidney, which was a mass of tubercles and caseous foci.

Cured.

Fig. 19.

The left uretral ostium is shriveled, looks flattened-out. In the surrounding area, but little reddened as yet, are whitish spots resembling cicatricial tissue. Numerous blood-vessels extend from the periphery of the field of vision toward the central area, which appears washed out, bloodless.

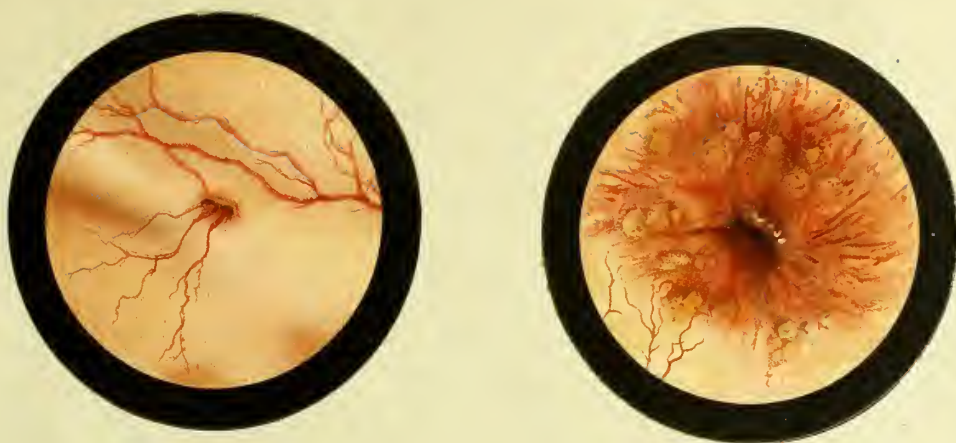


Plate VIII.

Fig. 17 and Fig. 18. Typical changes in the region of the left uretral opening, with tuberculosis of the left kidney. Circumscribed tuberculosis of the bladder.

Fig. 19. The same case six months after nephrectomy. The tuberculosis of the bladder in process of healing.



Fig. 20, Fig. 21, Fig. 22.

Fig. 20. Normal, dimple-like ostium of the right ureter at the apex of the uretral swelling. Fig. 21. Reddened, gaping ostium of the left ureter. The vesical mucous membrane in the vicinity is reddened in spots and puffed up; in the immediately adjacent portion in the left half of the trigone (Fig. 22), we find typical gray-yellow nodules and flat ulcerations.

The case is one of tuberculosis of the left kidney.

Anamnesis: M., *æt.* thirty-six, postal clerk. The trouble began three months before treatment, with violent pains in the left side and hematuria, since when the painful urging to urinate has become more frequent. The urine is turbid and contains pus; the left kidney painful on pressure; and the left uretral urine is rich in bacilli tuberculosis.

Operated March 22, 1907 (*Rumpel*): Extirpation of the tuberculous left kidney. Two years later the patient is in excellent general health; has gained in weight; the urine is clear.

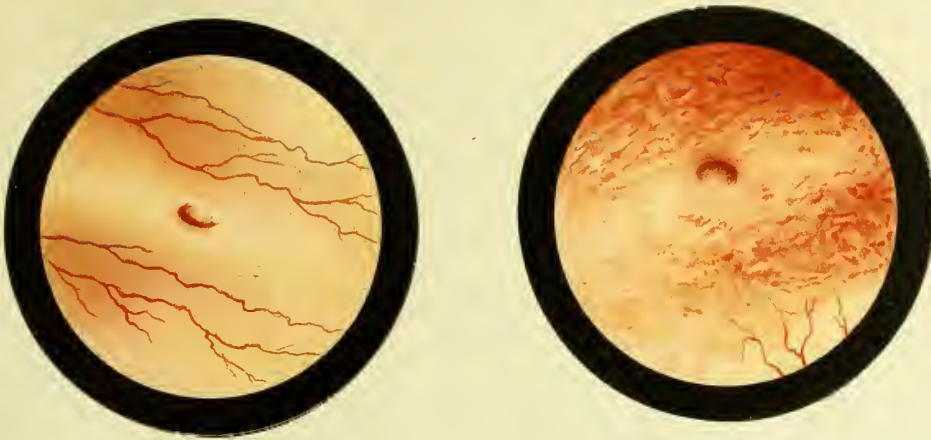


Plate IX.

Fig. 20 and Fig. 21. Circumscribed tuberculosis of the bladder in the left uretral region, in a case of tuberculosis of the left kidney. Right ureter normal.

Fig. 22. Tuberculosis of the bladder (left half of the trigone).



Fig. 23 and Fig. 24.

Conditions observed in the right ureter and its vicinity in the same case (cf. Fig. 21 and Fig. 22) seven months after extirpation of the tuberculous kidney. The uretral orifice is flat, the mucous membrane somewhat reddened in spots, but the blood-vessels are again clearly visible. The tubercles and ulcerations are entirely gone (Fig. 24), and numerous blood-vessels cross the field of vision.

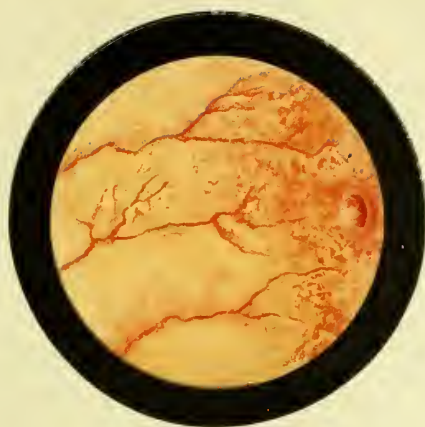


Plate X.

Fig. 23 and Fig. 24 present the same case shown in Plate IX., here depicting the healing process in the tuberculosis of the bladder seven months after nephrectomy.



Fig. 25 and Fig. 26.

The fiery red and swollen uretral orifice is distinctly seen (Fig. 25) against a generally inflamed mucous membrane. In this field there is nothing characteristic of tuberculosis, but in Fig. 26, presenting a portion of the fundus, typical nodules and ulcerations are observed.

The case is one of tuberculosis of the right kidney.

Anamnesis: Mrs. R., *æt.* thirty-six. For the last two years, urging to urinate and burning on micturition. Lately, pains in the region of the right kidney. The turbid urine is loaded with pus and tubercle bacilli. The right kidney is enlarged, uneven, painful. Cystoscopic examination shows edema of the right uretral opening and tubercle in the fundus. The indigo-carmin test is negative on the right side, promptly positive on the left.

Operation refused.



Plate XI.

Fig. 25. Areolar redness and edema of the right ureter
in a case of renal tuberculosis.

Fig. 26. Diffuse tuberculous in the fundus of the
bladder.



Figs. 27-29.

The right uretral meatus (Fig. 27) slit-like, at the summit of the uretral elevation.

The left ostium (Fig. 28) irregular, gaping, puncture-like, limited by nodular elevations and surrounded by reddened mucous membrane which exhibits more or less marked bullous edema. The tumefaction is locally delimited; in the lower portion of the visual field the blood-vessels are again clearly outlined.

Fig. 29 shows isolated nodular eruption and ulceration, with areolar redness of the mucous membrane.

The case was one of tuberculosis of the left kidney.

Anamnesis: Mrs. G., *æt.* twenty-nine, a coachman's wife. Four years ago, inflammation of lungs and pleural membrane, punctured later because of an empyema. For about a year the urine has been turbid; otherwise no marked disturbances. The cystoscopic view is found on Plate XII. Test of renal function with indigo-carmin gives prompt micturition from the right ureter; nothing from the left.

Operation, March 13, 1908 (Prof. *R. Bier*): Extirpation of the left kidney, which shows isolated nodules on the surface, and in the upper portion a larger focus. Microscopic diagnosis: tuberculosis.

Cured.

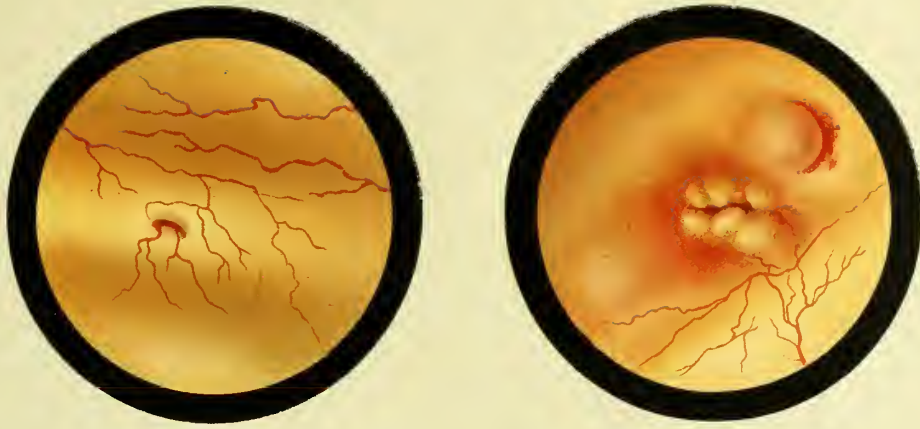


Plate XII.

Fig. 27 and Fig. 28. Right ureter, normal; left, tuberculous.

Fig. 29. Tuberculosis of the bladder.



Fig. 30 and Fig. 31.

The same case shown in Plate XII. Groups of tubercles with characteristic areolar redness.



Plate XIII.

Fig. 30 and Fig. 31. Discrete tuberculous eruption and ulceration in the vesical fundus.



Fig. 32 and Fig. 33.

Fig. 32. The right uretral orifice presents a large crateriform cavity surrounded by irregular swellings of mucous membrane. In the immediate vicinity is a more or less distinct group of small, round ulcers or nodules surrounded by a reddened and edematous mucous membrane.

Fig. 33. Bullous edema at the neck of the bladder. Fiery redness of the mucosa. Case of tuberculosis of the right kidney.

Anamnesis: W., *æt.* twenty-eight, student. Operated a year ago for tuberculosis of the testes. Since then, turbid urine, pain on micturition, pulmonary tuberculosis. Cystoscopic view, *vide* plate. Purulent urine from the right ureter.

Operation (Prof. R. Bier): Extirpation of the tuberculous right kidney. Later, *exitus letalis* due to the pulmonary tuberculosis. Left kidney normal.



Plate XIV.

Fig. 32. Crater-like uretral ostium in a case of renal tuberculosis.

Fig. 33. Bullous edema in cystitis tuberculosa.



Fig. 34 and Fig. 35.

Round, yellowish-gray elevations of about the size of pinheads rising isolated or closely grouped from a mucosa, which *in toto* is somewhat redder than the norm. The narrow, hyperemic zone surrounding the tubercle is characteristic. The neighboring blood-vessel (in Fig. 34) has a pallid, washed-out appearance.

The case is that of a teacher, *æt.* twenty-four, castrated because of epididymitis tuberculosa.



Plate XV.

Fig. 34 and Fig. 35. Isolated tubercle of the bladder.



Fig. 36 and Fig. 37.

In the midst of the diffusely reddened mucous membrane is an ulcerating surface about the size of a quarter-dollar covered with floating necrotic tissue and coagula of fibrin. In the periphery (Fig. 36) are some isolated nodules. The case is one of mixed infection, with renal tuberculosis.

Anamnesis: G., *æt.* thirty, agent. During the last four months violent pains in the bladder, tenesmus, turbid urine, pains in the right lumbar region.

Operation June 3, 1907 (Prof. *R. Bier*): Nephrectomy. Tuberculosis of the right kidney.

Cured.



Plate XVI.

Fig. 36 and Fig. 37. Cystitis ulcerosa in the region
of the right uretral opening.



Fig. 38 and Fig. 39.

Right uretral orifice enlarged (as compared with the left), gaping, slight areolar redness, pallor of blood-vessels; the uretral elevation shows irregular protrusions.

The left uretral opening is slit-like and located at the apex of the uretral fold; blood-vessels sharply defined.

The patient had tuberculosis of the right kidney.

Anamnesis: V. S., *æt.* thirty, lieutenant. For the last two years catarrh of the bladder, with varying complaints; urging to urinate; turbid urine; acquired gonorrhea three years previously. Right renal region sensitive to pressure, kidney enlarged. Indigo-carmin test: Right, negative; left, positive. Uretral catheterization gave purulent urine from the right side.

Operation, March 18, 1908 (*Rumpel*): Nephrectomy; nephrophthisis caseosa.

Cured.



Plate XVII.

Fig. 38 and Fig. 39. Right and left uretral orifices in tuberculosis of the right kidney.



Fig. 40 and Fig. 41.

Just below the right uretral orifice whose slit-like opening is seen in the right of the visual field, is a papilloma the size of a walnut. The tumor rises in full plasticity from the intact mucous membrane, the overhanging margin indicating the presence of a pedicle. A few somewhat longer tufts are, obviously, floating in the vesical liquid.

Fig. 41 shows the border of the tumor, the prism being brought somewhat nearer. The individual tufts, casting shadows upon the vesical wall, are seen more distinctly. The uretral opening appears in the form of a slit.

Anamnesis: A postal official, *æt.* thirty-five, who for some time had suffered from hematuria. The tumor, removed by *sectio alta*, was a pure papilloma, benign in type.

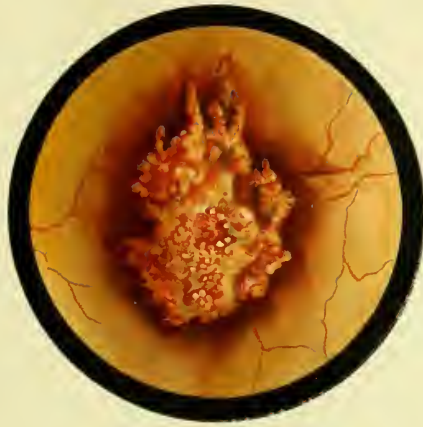


Plate XVIII.

Fig. 40 and Fig. 41. Benign papilloma in the region of the right uretral orifice.



Fig. 42.

Marginal portion of a benign papilloma. In the single tufts, some of which, peripherally, are thickened like a club, the central blood-vessels are seen with their loop-like turn at the end of the tuft more or less distinctly.

Fig. 43.

Fig. 43.

The tumor, about the size of a small apple, is composed of two parts differing greatly in appearance; one, with remarkable (because apparently long-plumed) tufts, the other a dense coagulum of blood with incrustations on its superficies.

The tumor, when removed, showed single tufts enclosed in the stone-hard, calcified coagulum of blood.

For the anamnesis: *Vide* Plate XX.

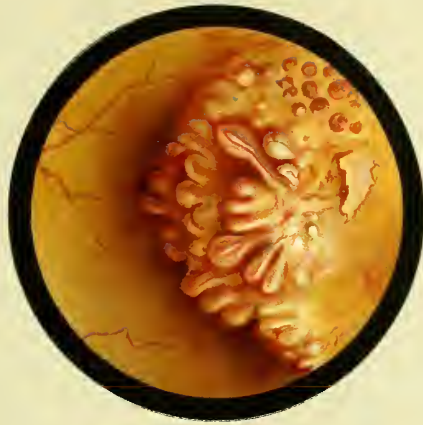


Plate XIX.

Fig. 42. Benign papilloma.

Fig. 43. Benign papilloma with a solid coagulum of blood.



Fig. 44 and Fig. 45.

Same case as Fig. 41.

The white, papillomatous tumor with the dark-red and incrustated coagulum of blood rises in full plasticity from the mucous membrane, which shows trabecular hypertrophy of the bladder wall.

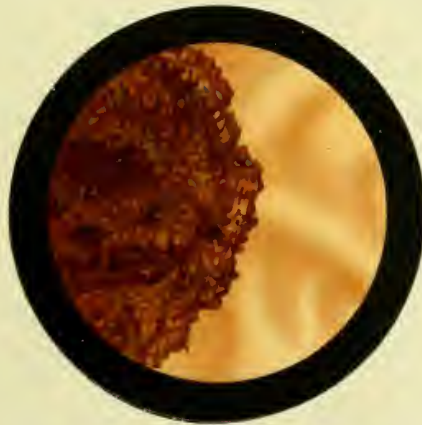
Anamnesis: K., *æt.* sixty-nine. A year ago, for the first time, hematuria. More recently, frequent spontaneous passage of blood with the urine; otherwise without complaints.

Operation, Jan. 23, 1907 (Prof. *Borchardt*): *Sectio alta* and extirpation of the tumor, the size of a pigeon's egg. Histologically, a benign papilloma.



Plate XX.

Fig. 44 and Fig. 45. Papilloma, with incrusted coagulum of blood, on the anterior bladder wall.



Figs. 46-49.

Because of the diffuse cystitis present, a view of the mucous membrane, *in toto*, of the bladder becomes much more difficult, yet the white tufts, some of them long-plumed, rise up from the edematous mucosa with sufficient clearness. The tumor, extirpated *via sectio alta*, was the size of a small apple, the papillomatous tufts partially necrotic.

Anamnesis: W., *æt.* fifty-five, laborer. Ten years ago, hematuria for the first time; no other complaints. The hematuria ceased spontaneously after a single day. For three weeks hematuria has been constant; violent pain on micturition.

Operation, Oct. 17, 1907, (Prof. R. Bier): *Sectio alta*. Removal of the tumor, which turned out to be a benign papilloma.

Cured.





Plate XXI.

Figs. 46-49. Benign papilloma in the fundus of an extremely inflamed bladder.

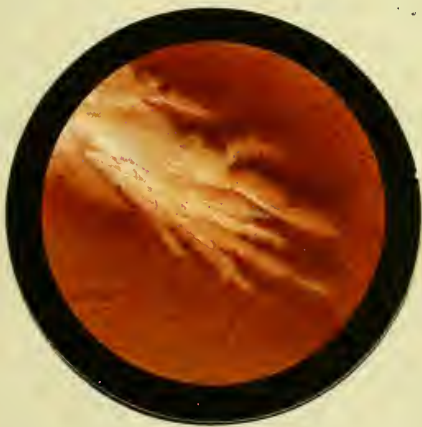


Fig. 50 and Fig. 51.

The mucous membrane is a brilliant red; trabecular hypertrophy of the bladder wall. Around the orificium internum urethræ is a group of globular tumors, whose smooth surfaces are formed of mucous membrane, in which the outlines of blood-vessels are distinctly seen. Because of the slight mobility, *inter se*, of the growths, a certain degree of pedicle formation seems probable.

Anamnesis: Boy, *æt.* three, brought to the clinic because of retention of urine. Cystoscopy gave the adjacent view.

Operation (*Rumpel*): *Sectio alta*. Extirpation of the tumors, histologically fibromyxomata.

Cured.

(The case was described more fully in the session, June 15, 1908, of the Independent Association of Berlin Surgeons.)



Plate XXII.

Fig. 50 and Fig. 51. Fibromyxoma at the neck of the bladder in a boy, *æ*t. three.



Fig. 52, Fig. 53 and Fig. 54.

The mucous membrane of the bladder is reddened; extravasations of blood above the vascular channels (cystitis hemorrhagica, Fig. 53). The tumor, found in the fundus vesicæ near the left ureter (Fig. 54), was about the size of a hen's egg. Single portions of the margin are reproduced in Figs. 52-56. The tumor is, in part, purely papillomatous (Fig. 52); partly irregular, lumpy and clearly visible.

Anamnesis: N., æt. thirty-nine, foreman fourteen years in an anilin factory. A year ago, sudden passage of blood without pain; later, increase in the bleeding. Cystoscopically, a lumpy, partly villous tumor in the right half of the trigone.

Operation (Prof. Borchardt): *Sectio alta*. Extirpation of the growth. Microscopically: A papillary carcinoma. After transient improvement, relapse in about six months.

Exitus letalis.



Plate XXIII.

Fig. 52, Fig. 53 and Fig. 54. Papillomatous cancer in an anilin worker (cystitis hemorrhagica).



Fig. 55 and Fig. 56.

Marginal portion of the tumor described on the preceding plate.

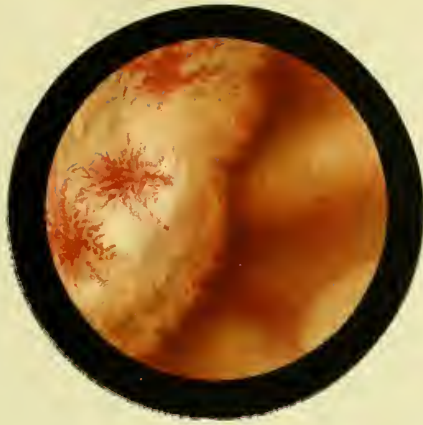


Plate XXIV.

Fig. 55 and Fig. 56. Papillary cancer in an anilin worker. (Cf. Figs. 52-54.)



Fig. 57.

A moderate cystitis; in the middle portion, a deep, retracted scar due to a *sectio alta*; in the lower part of the visual field, a papilloma formed by a conglomeration of strawberry-like tumors; to the left of the field a piece of necrotic tissue.

Fig. 58.

The lower edge of the same tumor.

Anamnesis: Woman, *æt.* forty, operated repeatedly for papillomata of the bladder—first by the endovesical route, later by *sectio alta*.



Plate XXV.

Fig. 57 and Fig. 58. Papilloma in the vertex of the bladder.



Fig. 59.

The greater portion of the visual field is occupied by a flat ulcer, whose everted edge stands in sharp contrast to the edematous mucous membrane. The base of the ulcer is furrowed and discolored.

Anamnesis: Mrs. Z., *æt.* forty-four. For the last half year, pains in the region of the bladder; pains on urinating; urine turbid and malodorous.

Above the symphysis a dense tumor of the size of a small apple is palpable. Cystoscopically, a crateriform ulcer in the vertex of the bladder with precipitous margins and neoplastic in character.

Operation, June 2, 1907 (*Rumpel*): *Sectio alta*. The tumor, about the size of a small apple, had become adherent to the peritoneum. Resection of the vertex of the bladder. Microscopically: Scirrhus.

Cure. No relapse during the year.

Fig. 60.

Small, pediculated fibroma at the summit of a prostatic swelling.



Plate XXVI.

Fig. 59. Infiltrating carcinoma of the vesical vertex.

Fig. 60. Hypertrophy of the prostate.



Fig. 61.

The prostatic lobes, projecting markedly on both sides, delimit the door-like opening, in which is seen a fresh coagulum of blood. In the background, the trabecular bladder.

Anamnesis: D., *æt.* seventy-two, butler. For many years, difficult urination; lately, retention of urine. Per rectum a hard, knobby prostate is palpable. Urination free.

Operation (*Rumpel*): *Sectio alta*; enucleation of the prostate. (Cf. Fig. 16 in the text.) On examination a year later, the urine was passed freely and comfortably.

Fig. 62.

The tumor-like margin of a lateral lobe projecting into the bladder.



Plate XXVII.

Fig. 61. Hypertrophy of the prostate (lateral lobes symmetric).

Fig. 62. Hypertrophy of the prostate (middle lobe).



Fig. 63 and Fig. 64.

Enormous prostatic tuberosity with marked intravesical growth (an indication for transvesical enucleation).

At the middle point of the free margin in Fig. 63, necrosis from the pressure of the permanent catheter.



Plate XXVIII.

Fig. 63 and Fig. 64. Hypertrophy of the prostate.



Fig. 65 and Fig. 66.

Trabecular bladder. Cystitis. Formation of villi along the free edge of a prostatic cancer; the inflamed trabecular bladder in the background. In Fig. 66, behind the overhanging villi, is seen the dense prostatic protuberance.

The patient was a cachectic man, *æt.* seventy-five; the prostatic tumor very large, hard as a stone.



Plate XXIX.

Fig. 65 and Fig. 66. Carcinoma of the prostate.



Fig. 67 and Fig. 68.

On the slightly inflamed mucous membrane of the fundus are found two whitish calculi with smooth surface and about the size of walnuts.

The nucleus of the stone in Fig. 67 was a piece of wax. (Cf. Fig. 18 in the text.)

Anamnesis: A., *æ.t.* forty-seven, laborer. Acquired gonorrhea twenty years ago. During the last year, urine difficultly voided. In order to urinate more easily the patient passed a stalk of straw into the urethra. Lately, pains in the region of the bladder, tenesmus. Urine turbid, albumin, neutral. Skiagraph gives calculus shadow.

Operation (Prof. *v. Bergmann*). *Sectio alta*; extraction of the stone (nuclei: a piece of straw and a chip of wax).

Cured.



Plate XXX.

Fig. 67 and Fig. 68. Phosphatic calculi.



Figs. 69-71.

Fairly-marked inflammation of the mucous membrane of the bladder. In Fig. 69 (*supra*) is seen a rather elongated, whitish concretion, whose free edge projects into the cavity of the bladder and throws its shadow upon the vesical wall. Not far from the apex of the concretion is a corset-like constriction, yellowish in hue and particularly distinct in Fig. 71.

The nucleus of the stone was a bit of straw, visible in the constriction just mentioned.

For the anamnesis, consult Plate XXX.



Plate XXXI.

Figs. 69-71. Phosphatic calculi.



Fig. 72 and Fig. 73.

Grave cystitis. Red and velvety swelling of the mucous membrane. Above is the apex of a calculus, the size of a hen's egg and, apparently, with rough surface. Below, an indentation in the marginal portion of the same stone.

Anamnesis: Man, *æt.* seventy, with bladder troubles.

Operation (Prof. *R. Bier*): *Sectio alta*; extraction of the calculus.

Cured.



Plate XXXII.

Fig. 72 and Fig. 73. Vesical calculus about the size of a hen's egg in the fundus of a violently inflamed bladder.



Figs. 74-76.

Fig. 74. In the upper portion of the visual field is seen the free edge of a large stone, dirty yellow in color, rough surface. In the rear of this, the top of a greenish concretion the size of a cherry and protruding from behind the prostatic swelling.

Fig. 75. In the recess behind the irregularly swollen prostate a stone is firmly set.

In Fig. 76 the margin of the large and mobile calculus lies upon the prostatic tumefaction.

Anamnesis: H., *æt.* seventy-three, cabinet-maker. Urinary complaints the last twenty years, often from retention of urine under medical treatment; lately, more frequent urging to urinate, loss of strength, retention of urine.

Operation (Prof. *v. Bergmann*): *Sectio alta*; extraction of a calculus the size of a hen's egg and of two smaller stones caught in crevices. Tamponade.

Exitus letalis (pyonephrosis utriusque lat.).



Plate XXXIII.

Figs. 74-76. Calculi in a case of prostatic hypertrophy.



Figs. 77-79.

Fig. 77. Stone in the fundus of the bladder; mild cystitis. In the upper portion of the visual field an incruusted shred of tissue is seen.

Fig. 78. Stone the size of a hen's egg occupying the greater part of the visual field.

Fig. 79. A large calculus firmly set in the cervix of the bladder; grave cystitis; mucous membrane tufted.

Anamnesis: B., *æt.* sixty-five, tailor. For some months, urinary troubles; frequent retention of urine. Cachectic. Frequent micturition. Catheterization difficult because of the prostate and calculus. Hence, *sectio alta*. Extraction of the incarcerated stone. Drainage of the bladder.

Exitus letalis.



Plate XXXIV.

Figs. 77-79. Vesical calculi.



Fig. 80.

About eight minutes after injection of an indigo-carmin solution (according to *Völker* and *Joseph*) the uretral stream becomes faintly blue.

Fig. 81.

Diffuse cystitis. From the uretral opening a pyuric stream is expelled, casting a distinct shadow upon the wall of the bladder. The case was one of pyonephrosis.

Fig. 82.

From the uretral orifice drip black pearls of blood, forming a stratum on the vesical floor.

Anamnesis: Case of traumatic rupture of the kidney, appearing in the clinic five days after the accident. The kidney, extirpated later because of an infection, showed a number of oblique cracks in the renal substance.



Plate XXXV.

Fig. 80. Beginning passage of the blue dye in the
indigo-carmin test.

Fig. 81. Pyuria. Cystitis.

Fig. 82. Renal hematuria after laceration of the
kidney.



Fig. 83 and Fig. 84.

The mucous membrane of the bladder is strikingly anemic. From the ureter is expelled a worm-like yellowish mass of tissue. (Cf. Figs. 20-22 in the text.)

Anamnesis: E., *æt.* thirty-six, watchman. For three years, hematuria at intervals. Hypernephroma of the right kidney. Extirpation.

Cure.

Fig. 85.

Diffuse cystitis. In the urethral opening is seen a dentate, yellow concretion.

Patient, *æt.* sixty, with double nephrolithiasis and a serious myocarditis. During an attack, with total anuria, the calculus was discovered in the left ostium, loosened with the urethral catheter and removed. A flood of urine was then passed.





Plate XXXVI.

Fig. 83 and Fig. 84. Expulsion of pieces of tumor from the ureter in hypernephroma.

Fig. 85. A concretion caught in the uretral opening.







